THE BOOK of KNOWLEDGE

A CHILD OF LONG AGO

This picture was painted by Sir Thomas Lawrence, and hangs in the National Gallery with the title: "A Child with a Kid."

The Book *of* Knowledge

The Children's Encyclopædia

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Volume I

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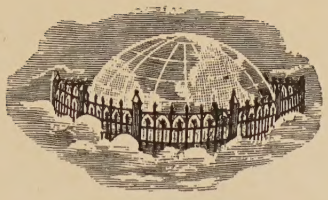

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INTRODUCTION

READING these books in my mature years, but calling my boyhood self to sit beside me in the reading, I realize what they would have brought to him in those long gone days on the prairies. What I cannot now carry to him, my boyhood self, except as he lives with me in the city or wherever I go in these grown-up days, I can in some measure help to bring to those who are now as he was then; and so I most gladly accept the invitation to write a few words of introduction, though I think that not many of the numberless readers of these volumes, young or old, will stand at the door very long, listening to any one telling of what is within, for every boy or girl, even if grown into man or woman, will find something of compelling interest in these pages. My own lads played no ball the day these books were brought home, nor did they wait to hear my preface, so eager were they to see and to read the articles themselves.

I read these books first in the midst of the busy, noisy, distracting city, and I found myself thinking that their pages were like automobiles, or aeroplanes or street cars or railway trains, carrying the city child into the country among the trees and rocks and birds and brooks and grass and mountains and clouds, where he could see and hear about the wonders of Nature. I read them again on top of a hill, underneath an oak tree, seated on a rock, where I could see mountains all the way round on the horizon; and then I thought how these magic volumes would bring all the great achievements of man, the wonders of his inventing and discovering, to those shut in by the mountains or by the sky on a little patch of flat plain or prairie.

So I am glad to introduce these books to the boys and girls in America, both of the country and of the city, that they may know something of the heritage which comes to them from being born in this world full of mystery, and upon this earth where billions upon billions have lived and left each a little, at least, for those coming after them,—a heritage which is for the most part beyond the reach of the unaided senses of these boys and girls, and which they can occupy as their own only by the help of those who have added the lenses of microscopes and telescopes and other instruments to the lenses of their eyes, who have read in rocks or bones or words the memories of the ages gone, or who have traveled far beyond their horizons in the present. And it is a happy fact that any boy or girl who has a good mind can, with such help, have that great and wonderful and beautiful world added to what he or she can actually see or hear or touch or smell or taste,—added to a little stretch of city, or village street or a few square miles of farm land.

What these books bring is not to take the place of a hard disciplining of the mind. The ability to perform such deeds as are here related comes not merely by reading of them. That power is developed only by days and nights of work and sacrifice. No amount of mere information can make up for the lack of these, as no amount of reading about the water will in itself qualify one to swim or to build a vessel. But this

information may furnish the incentive to work and sacrifice and give to one actually in struggle the benefit of the experience of the thousands who have made that struggle before.

I often call the boys in the public schools of New York my millionaires, not because they have, or ever will have, millions of dollars of their own, but because they have millions upon millions of minutes to spend. A boy of ten for example has a prospect of living until he is seventy (though the life insurance companies do not, I believe, allow him so high an "expectation"), which means that he has a fortune of over thirty millions of minutes. Of those millions he will have to spend nearly a third, or ten millions, in sleep, and another third in earning his food, shelter, clothing and other necessities of life. But he will still have a large fortune left to spend as he pleases. The failure or success, at any rate the largeness or narrowness, of his life will depend largely on how he pleases to spend this surplus,—and the poor boy will be as free and as able to spend it profitably as he who has millions of dollars; he can make himself a rich man in character, and knowledge, and influence.

Suppose a boy of ten were to spend fifteen minutes a day (about one-hundredth of his income) in reading these pages, omitting those too young for him or those which require him to give hours in following directions for doing or making certain things, he would probably be able to finish these volumes in two or three years, and he would at thirteen know more about the earth and the life on it than the wisest men knew a few generations ago. For example, though it took men ages to devise an instrument that would carry the human voice across a great distance, yet a boy of twelve can in an hour or two learn how that instrument, the telephone, is made and operated. And this encyclopædia is full of such information to help the boy begin his youth or manhood a little farther on than his ancestor.

I would have this work in every school as a library of supplementary readings—readings that will not be looked upon as "lessons." Indeed one might teach a child almost entirely from these volumes, for several years. But this encyclopædia is primarily a home book and not a school book. It is not like a grown-up encyclopædia, a work of reference which one does not think of reading consecutively or for pleasure (though I have myself read through an encyclopædia of several volumes and found it intensely interesting and profitable reading). This is an encyclopædia in that it gives the child or youth possession of the whole cycle of existence and circle of truth to which he is entitled by birth. The city boy and the country boy find themselves inhabitants of a universe a thousand times more wonderful and interesting than that which most of their elders knew at their age or dreamed of. And I can think of no good reason for keeping them from it. The facts of physics, biology, astronomy, history and language learned in these boyhood, girlhood days are never forgotten. Through them the child has inextricably woven into his being the life of the race and of the earth, who might otherwise be only a child of a certain valley or prairie, or of a certain street or tenement.

I often go back to Abraham Lincoln and try to imagine what this or that means or method of modern education would have been to him. Would it have helped or hindered in the making of such a man? Would these richly illustrated, absorbing books, I ask myself now, have tempted him from the later hard mastery of the few books that fed his genius? Would they have made too easy the path to the knowledge which mankind has reached by the direst suffering? It is possible that this would be the effect upon a sluggard or a vain mind, but the former would not in any

case hold itself to Lincoln's course of discipline, unless it found such spur as lies in these pages, and the vanity of knowledge is so rare in the child's mind and so easily cured that it needs not to be considered. A normal child's eager mind, this encyclopædia can but nourish and protect,—a mind that knocks inquiringly at all doors and drinks at all fountains, pure and impure. Here is a sanitary fountain, that bubbles up to every thirsty child. Here is a door that opens upon healthful fields.

The American home, especially in the city, is menaced by so many economic and social influences that one is glad to encourage any effort that will work against these. This little library making the child's world revolve around the place of its reading, will make many a home a more attractive centre of boy and girl life. The hearth has disappeared, but if such a library of good books could take its place, drawing the family about it, the social value of the hearth would be restored where now the cheer has flown into the street. So again I commend these as home books.

I have spoken of the boyhood self who sat beside me in the reading. But his opinion is not wholly untouched of age. I therefore turn to one of those thousands for whom all this treasure has been gathered and ask him to give ending to this introduction. He, a boy of seven, was being nursed because of a serious hurt and would be read to. And the book that he asked for was the last volume of THE BOOK OF KNOWLEDGE.

JOHN H. FINLEY.

AUGUST, 1911.

TO OUR READERS YOUNG AND OLD

SEVEN years ago the editors sent out the first edition of THE BOOK OF KNOWLEDGE to English-speaking boys and girls everywhere. During those years many things have happened upon this earth of ours, many new inventions have been made, and men and women have continued to think on many questions. Now we give you a new and larger BOOK OF KNOWLEDGE, which keeps the best of the old, and yet adds many things which boys and girls should know of this ever-changing world. You cannot find another set of books like this, for no one before has succeeded in putting together those things which will help boys and girls to understand themselves and the great world around them, and in telling of them in simple, clear words. Since THE BOOK OF KNOWLEDGE was first made, special editions have been printed in French and in Italian for the children of those nations, and in Spanish for our little friends in Cuba and South America.

In order to write the articles for you, the editors and their assistants have read many books, printed in many languages; they have looked into the laboratories where scientists are working to solve the many puzzles of the world around us, and to find its secrets; they have gone through the busy workshops where the things we use every day are made; they have worked in hospitals where men and women struggle to conquer disease; they have selected from the whole field of our literature some of the most beautiful thoughts; they, or those working for them, have gone to and fro over the whole earth to find interesting things and have brought back stories and pictures for you to read and to see.

They have told you the stories of the sky, the sea, the earth, and of life upon the earth; and have shown you how one thing affects another. They have shown how the rain, the wind, the heat, the cold, the life of plants and animals in ages gone by, make possible our life to-day. They have told you the story of man from the beginning. The story of all the great nations which have risen and ruled on the earth has been given you that you may see where they succeeded, where they failed, and what they have given to the world. Best of all, they have told you of these wonders in words that you will understand.

Your editors, American, English, and Canadian, have worked together to make a book for English-speaking children no matter where they live. We have made a book for the boy on the lonely Australian sheep farm, as well as for the girl in the New York apartment house. Boys and girls on farms in Wyoming or Manitoba, among the Scotch mountains, on Southern cotton plantations, in the far-away Philippines, in India, in Africa, will all find that the book has much for them. Wherever boys and girls speak English, sets of these books—yours and ours—will go, to help them to become bigger, wiser, better men and women. With every set will go the good wishes of all the editors who have worked with the book until they love it.

HOLLAND THOMPSON.

THE MEANING OF OUR BOOK

THIS work is an attempt to bring together that part of human knowledge really worth while, so that even a child may understand.

Nothing could be more false to its purpose than to imagine that it seeks to cram the mind with things that children need not know. It is based upon a definite idea of education which the editors have developed both from study and experience and which they have worked out in the volumes now before you. The bringing up of a child is conceived as the supreme task in which we can engage, but there is no sympathy with those who would set a child down at a desk almost before it can run. It is believed that in the early years a child is its own teacher, and that in a right environment it will teach itself more than all the teachers in all the schools can teach it.

It cannot be urged against this book, therefore, that it has come to steal away the joy of childhood and put a bitter grinding in its place. It has come, indeed, to bring more joy to childhood, believing that true joy of life comes from sympathy and understanding.

Left to wander in this field, the child will find whatever it wants. For the youngest of all, its nurse will find her lullaby. The child in the nursery will find its nursery rhymes, and all the best stories that have ever been told. The child who can be left out of doors to play will find here the beginning of its interest in natural things. All the games and pastimes, all the fireside enjoyment the children love, the mechanical interests of boys, the domestic interests of girls, and home-made toys for both of them—this is but one phase of the practical value of the book. For the boy and girl at school these pages teem with precious things; for fathers and mothers, teachers and governesses, they may well become invaluable. It is a book for grown-ups and children too—to be read *by* children or *to* children. It is an encyclopædia of everything that comes into childhood, and by childhood is meant all that period of life when the sensitive mind is being formed by the influences about it.

THE BOOK OF KNOWLEDGE is what it pretends to be. It is written in the words the children know. The art of saying things simply has long been dying out, but the writers of this book will seek to revive it. They will be simple by being natural; they will make a children's book without childishness, a book that children may read because it is simple, and that men may read because it is plain. The great mysteries will be made as clear as words can make them; and while the child will find its sense of wonder grow, it will find, too, that its mind is widening all the time, understanding more and more.

ARTHUR MEE.

THE PURPOSE AND THE PLAN

A WORD TO PARENTS

THE fundamental purpose which the editors of THE BOOK OF KNOWLEDGE have kept constantly before them is the development of the child in the broadest sense. The work has been planned to aid in his education, not, however, by making the acquisition of knowledge easy, but by making the process interesting. The design has been to awaken in the child's mind a lively interest in the great world about him, to encourage the growth of self-reliance by leading boys and girls to investigate for themselves, and to set high ideals.

The reason for including every department will be apparent after examining the work. The wise parent will not neglect the opportunity offered by the book to study the natural disposition and capability of his child. A valuable forecast of his future may be obtained from his attitude towards the various departments. In many cases a boy's life-work will be indicated, and possibly determined, by his possession of these books.

The editors do not intend the volumes to be a substitute for text-books, but a supplement. In them the child will find many subjects treated at length which are barely mentioned in the text-books. On the other hand, the child who has had these books in his possession will be able to understand and to comprehend much taught in school which might otherwise pass over his head. The child, owning and using THE BOOK OF KNOWLEDGE, will easily outstrip his comrade of equal ability without this advantage.

The titles of the sixteen great departments included in THE BOOK OF KNOWLEDGE are upon the title page. The arrangement of these departments, however, differs from that which may, at first thought, seem logical. Instead of devoting a volume or volumes to each, the departments are distributed throughout the set, one or more sections appearing in almost every volume. The reason for this distribution, nevertheless, has its root in sound psychology. The average child can not concentrate long upon those subjects which require close attention. After a comparatively short period, he must change his occupation or rest.

In accordance with this principle, therefore, the subjects are treated in articles of varying length, but no section is so long that the endurance of the normal child will be unduly taxed. For the unusual child or for the normal child, urged on by special interest in a subject, at the end of each article the page on which further treatment may be found, is indicated, and to this page he may turn, neglecting for the moment what lies between. Since no fact stands alone and since our real and vital understanding of any fact depends upon our recognition of its relation to other facts, cross-references are extensively employed. Thus history, biography, geography and science are all linked together.

The text-books of the future must follow THE BOOK OF KNOWLEDGE in the extensive, even lavish, use of pictures in teaching. Reading is really a complicated process. The child must translate the symbols into words, the words into ideas, and the mental images are often confused in consequence. A good picture, illustrating scenes in foreign lands, manners and customs, methods or processes, is often the flash of a search-light into mental obscurity. The child is given two chances to remember and understand instead of one.

THE SPACE NO MAN CAN MEASURE: FLYING FO

This picture helps us to realise what our minds can hardly understand—the wonderful size of the universe, and the immeasurable distances in space. These trains represent the fastest means of travel that men have yet been able to invent, the express train travelling a mile a minute, fast enough to go around the world, if there were a twenty days. Yet such trains as we can see them, would take 177 y there were a railway on which they

ORTY MILLION YEARS TO THE NEAREST STAR

and nothing to stop it, in less than hich dash past us almost before ravel from the earth to the sun, if avel a mile a minute and never stop; and a train starting from the earth for the nearest star would not arrive for forty million years! Our artist has drawn an imaginary railway line leaving the earth for the planets, and the figures on the trains give the time it would take the trains, travelling all the time at sixty miles an hour, to reach the planets.

THE WORLD AND THE UNIVERSE

THE earth on which we live is so big that we cannot possibly see it all at the same time. It has come to be what it is through millions and millions of years. Yet the earth is only one of many, many worlds, some of them much greater than the earth, all of them moving through space like a ball when it is thrown in the air. The moon was once a part of it, before it broke away. What do we know of all these worlds? How were they made? Is every star a sun like ours, and are there little children playing on balls, like the earth, that circle round the stars? How did the moon break away from the earth? How does the sun give us life and warmth? All these questions we ask as we think of the great universe in which we live, and we come to know more and more about the world as time goes on. In this part of our book we shall learn all that we can about these wonderful things.

THE BIG BALL WE LIVE ON

By C. W. SALEEBY

AT the bottom of the sea live creatures which do not know what light means, but always live in utter darkness. They have neither eyes nor ears, and they can only feel. The world as these creatures know it is just of two kinds—part of it feels as if it could not be eaten and part of it feels as if it could. There is no day or night; there are no seasons, no sun, moon, or stars; no sounds, no beauty of any kind; nor do they even know that there are in existence any other creatures like themselves.

It is as if a child spent its life in utter darkness in bed, with nothing to see or hear, and with only one kind of change in all its life—the change between having something in its mouth and having nothing. That is not the sort of life that any of us would wish to live, though there are people in the world whose life is not much better.

How different our own life is! We have many senses, or gateways of knowledge, as they have been called. Some of these, such as taste and smell, are less important than others. Even the sense of feeling or touch is not of the highest importance, and the same may be said of the sense of heat and cold. Then there comes the wonderful sense of hearing, by which many different kinds of knowledge reach us as well as many things that are beautiful—as the song of a bird, the sound of the sea, the voices of our friends, and that wonderful thing called music. But far better than all these as a gateway of knowledge is the sense of sight. Through sight we find out a never-ending number of wonderful things. Sight shows us the ground beneath our feet and the heavens above us; the sun, moon, and stars, the shooting stars, the lightning, and the sunset. It shows our own bodies and the bodies of our friends, and a whole host of living creatures of many kinds. Sight tells us—and here our sense of heat and cold helps us also—that time is divided into hours of light and hours of darkness.

This common fact of day and night is really wonderful when we think of it. The commonest things are the most wonderful, if we look at them not merely through the eyes of our heads, but also through the eyes of our minds. This wonderful sense of sight tells us also of changes which do not come and go as rapidly as day and night, yet which never fail to come in their due order; which go as surely as they come, and return as surely as they go.

After months of cold and snow and ice, there follows what the poets have called "the birth of the year." The days get longer; the buds come out in the trees and hedges; the birds sing more sweetly; the world puts on a new green dress; the air becomes warm and the sun hot—we pass through spring to

summer. Everyone knows that summer will not last always; the power of all the wisest men in the world cannot keep it for us. The corn becomes ripe for harvest and it is early autumn; the leaves become brown, the flowers wither, and then they seem to die; the leaves drop from the trees, and all the green and beautiful plants seem dead.

THE GREAT CHANGES THAT ARE ALWAYS GOING ON

Autumn gives place to winter, with its cold and snow, but when spring comes the trees that seemed dead become green again. They did not really die, and they are as surely alive in winter as in summer; but they must obey the changes of the year. These changes will all come back again and again and again, just as night follows day. They were going on thousands of years ago, and will be going on in thousands of years to come. The creatures that live in darkness at the bottom of the sea know nothing of them, but we do, and, just like the trees, we have to live our lives in a way that fits them. In the daytime we are awake; at night we sleep.

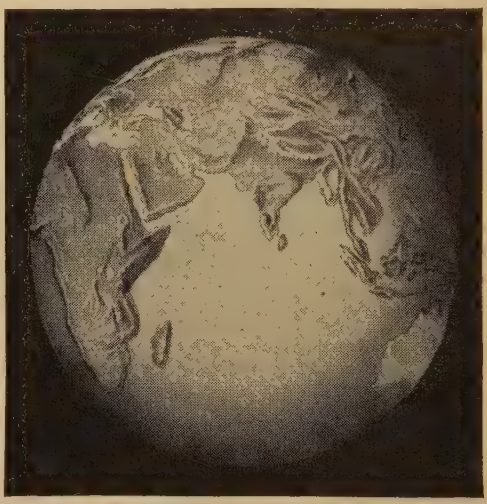
In the summer we can do things which we cannot do in the winter, and we have to change our clothing—though we lighten our clothing when the trees put on theirs, and put on more clothes just when the trees strip themselves. It is our business, then, to understand the secret of all these things.

Sight is the most precious of all the senses, not merely because it tells us so much more than any other sense about our own earth, but also because it shows us a great and beautiful and wonderful world far beyond the world in which we live.

ONE OF THE MOST WONDERFUL THINGS WE CAN THINK OF

All our other senses put together could never tell us about this. Our own earth, because it is ours, because we cannot leave it, and because it affects our lives so closely, is of most interest to us. Yet we find, when we look beyond the earth, that things which are far away, things which we can never reach or touch, but can only see, are of great importance to us. Chief among these is the wonderful sun—the great fire which keeps us warm and gives us light and heat. Without the sun nothing could live upon the earth, neither the creatures at the bottom of the sea, which never see the sun and do not know of its existence, nor we ourselves, who see it nearly every day. Then there is the moon, which often gives us light at night, and there are the thousands of stars which make us ask what they are. We all know the rhyme about the twinkling little star, "How I wonder what you are?" The answer to this question is one of the most wonderful things that we can think of.

But even if we never raised our eyes above us, or, at any rate, never looked



The World is round like a ball, and this is the side of the ball called the Old World, the part of the World that was known before Christopher Columbus found America. The rough part of the ball is land, and the smooth part is water. There is much more water than land.

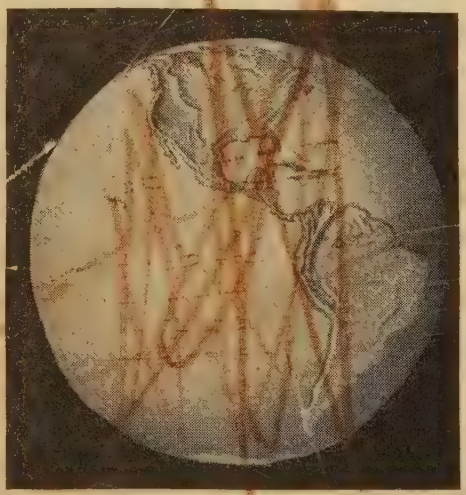
higher than the tops of the hills and mountains, we should find far more things to wonder about than any man can understand in a lifetime; a million times more, indeed, than all the men of all times put together have yet been able to understand. We shall never be able to answer all the questions that might be asked, and yet every answer that we do obtain, and every question that we ask properly—even if we never get an answer to it—is of value to our lives. Everything that men find out is of value to use and the things that men have already found out make our lives happy and useful, and make all the difference between our own lives and the miserable lives of savages, which to us seem scarcely worth living at all. The more we know

THE PROCESSION OF THE WORLDS

The earth is a great ball, floating in space. It is not the only world; it is only a fragment of the great Universe—the name we give to all created things. In the picture the earth looks the biggest of all the globes, but that is only because it is the nearest to us. Round the sun are many other worlds, and millions of stars. The great world-balls travel, always spinning, round the sun. We shall come to know these things as we read our book, but this picture helps us to understand what a mighty universe we live in. Nobody has ever seen the universe like this, because nobody can get outside it to look; even if we could, it is so vast nobody could see it all. Through a telescope we can see a bit of the world nearest our earth; but the majesty and wonder of the universe is something no man can understand.

and the more we understand—even though it be very, very little as compared with all that there *is* to know and understand—the better for us all.

This is a fact worth thinking about at the very beginning. These questions cannot be asked and answered without trouble. Every one of us must give some part of his life to them; and many men, and many women, too, have given their whole lives to them. Why should we trouble at all? some boy or girl may ask. Why should we not just play and eat and sleep all the time? Why should we not be like those creatures at the bottom of the sea, which seem to say of all the world around them, "I do not know, and I do not want to know, and I do not care; it makes no difference to me, and I cannot be bothered with it"?



This is the other side of the ball, the New World, called America, which the men living in the Old World did not know until Columbus found it, four hundred years ago. America is one of the greatest countries in the World, so big that it takes nearly a week to go across it in a fast train.

Well, there are men and women and children who live just like that; but it is not really *living*. If you live like that, your life is worth just about as much as that of the creature at the bottom of the sea, which never thinks about anything—not even about the other fishes or about itself. The only thing that makes that kind of life worth living is that it may lead to something higher. If we ourselves are to live that sort of life, then all the time and struggle and labor which has been needed in the past to live at all has been thrown away, and we have spoilt it all in a moment. It tumbles down like a house of cards, and we tumble with it. Ours is the highest kind of life there is, and the higher the kind of life we live the more we need to know and understand. Perhaps we should feel this for ourselves if all our gateways of knowledge were suddenly closed, if all that we remember were forgotten, and if we became like creatures that live in darkness.

THE VERY BEGINNING OF THE STORY OF THE EARTH

Well, we have let our eyes roam in many ways around us, up to the heavens and down to the bottom of the sea. Now we must begin at the beginning of our story, and tell it as it really happened. This is all very well when you are telling a story about something you have seen yourself, but it is a very different thing when you were not there, but have come in at the end, so to speak, and have to find out what happened by what you see around you when you get there. We have all heard about clever detectives who go into a room where thieves have broken into a safe, and find out all about it. They make a note of everything they see, examine a piece of a tool that the thieves dropped, the finger-prints on the door of the safe, and so at last, if they are clever and fortunate, they are able to find out what happened, even though no one saw the burglars at their work.

Now that is what men have to do in telling the story of the earth, and if we are going to tell the story well, we shall have to do what a writer does when he is telling a detective story. He begins by saying what the detective first thought when he came upon the scene, and how, as he found out one thing after another, he began to put his story together bit by bit until at last the whole thing was as plain to him as if he had been looking in at the window all the time.

HOW THE FIRST MEN WERE PUZZLED ABOUT THE STORY OF THE EARTH

Now, the story of the earth is far more puzzling, as it is far more interesting, more wonderful, and more glorious, than any detective story that ever was written or ever will be written; and when men began to think about it first they were very easily deceived. They were misled by what seemed to be plain enough, but

was really very different from what it seemed to be. Until they got these mistaken notions out of their heads, they could not get any further.

Suppose you want to go upstairs to your bed-room, and you start by walking one step down to the kitchen, it is quite plain that, however well and bravely and fast you go on walking downstairs, you will never get to your bed-room. The simple truth is that you have started the wrong way, and that will never do. Well, men started the wrong way in trying to find out the story of the earth. It was not their fault, for the wrong way looked like the right way. They were clever men, and did not mean to be beaten. The harder they worked the more difficulties they got into.

THE MEN WHO THOUGHT THE EARTH WAS FLAT

Now, the first man who tried to understand the earth would naturally think that there were, at any rate, two or three great facts which he could start with, about which there was no doubt at all. To begin with, it seemed quite plain that, though there were hills and valleys, ups and downs, yet, on the whole, the earth was *flat*. The hills and the valleys seemed to be mere ups and downs, like the ups and downs on a bad road, or on a badly-rolled tennis court. However far you walk your head is still upright, at the top of you, and your feet are still beneath you. You will never come to an edge and fall off. Walking on the earth, or even going in a train, is not at all like walking on a ball, as people do at the circus.

Well, then, men thought that here was something plain. First of all, there was this great stretched-out earth, giving us a certain level upon which we live, and stretching out in all directions. Then men began to think of everything else in the whole world as either *at that level* or else *above that level* like the sky, or else *below that level*. It was not possible to get very far down below because of the difficulty of digging; but still, just as there was an *above*, so men knew that, of course, there must be a *below*.

THE GREAT MYSTERY OF THE UNDER WORLD

In some parts of the world it was possible, men thought, to get hints of the lower regions, and men came to learn that the earth below was hot and on fire. How did they find this out? Here and there upon the surface of the earth there are great holes, usually found at the tops of mountains. These mountains have a special name which we must learn; they are called *volcanoes*, and the holes are called *craters*. Sometimes a volcano becomes excited, and all sorts of things come up from below and are shot up into the air through the hole at the top. Now, these things that come up are all terribly hot, and with them comes a great deal of black smoke. So it seemed probable that what men called the *under world*—that is to say, the part below the level of the earth—was a very hot place, probably with fire always burning in it.

Well, now we have got so far as to have in our heads a clear notion of the flat place we live on, an *up* to the heavens and a *down* to the lower regions; *but the greater part of all this is nonsense*, and the more men believed in it the more nonsense they invented.

The earth is not flat like a table, but round like an orange. We know this by the way a ship comes into sight. At first we see only smoke.

Then we see the top of the mast, as if the ship were climbing up the side of a hill.

Then the front appears, and we see the vessel rising higher.

HOW WE KNOW THE EARTH IS ROUND

If the earth were flat we should see the whole of the ship at once, not the front of it first and the rest of it bit by bit.

But we do not see it that way. We see it rising as if it were sailing up the other side of a ball.

At last it is over the circle, sailing clear on the top of the ball.

HOW WE KNOW THE EARTH IS ROUND

It seemed certain that the earth was flat, and if there was one other thing that seemed certain, it was that the earth was quite still and at rest. We do not feel the earth moving under our feet; we cannot imagine that it moves. If we look "up" to the stars and watch them carefully from day to day and from night to night, they seem to come up from the edge of the earth, in a direction which we call the East. Then they seem to travel across the sky, and then to dip down at the other edge of the earth, which we call the West.

WHAT MEN USED TO THINK ABOUT THE SUN

We can easily see the sun doing this, as he seems to do it every day. At some time in the morning we see him in the East; he travels across the sky, and then he passes from our sight in the West. It used to be thought that the great fire of the sun was put out every night in the water in the West, and that then, in some mysterious way, it passed through the under world, and was set blazing again, and turned up next morning in the East to begin its journey afresh. Whatever happened to the sun at night, at any rate there seemed to be no doubt that it did what we think we see it do—rise in the morning, move across the sky, and set on the other side from where we first saw it rise. The notion that the earth itself moved seemed to be such nonsense that everybody laughed at it.

But at last there came the notion that, in spite of what we think, the earth is not flat! Some bold men actually declared that the earth was nothing else than a big ball, and that we lived on the outside of it. Many people laughed at such an idea. "If it is a big ball," they said, "we should be able to go right round it and come back to the place from which we started." Now, in those days the only part of the earth that men knew at all was scarcely more than a spot on its surface, and beyond this they knew nothing. So this idea of traveling boldly out in one direction and going on and on in a straight line until you came back to the place you started from seemed absurd.

COULD A MAN TUMBLE OFF THE EARTH?

Then, again, people argued that there could not possibly be other people on the under side of this big ball, for if they were they would fall off, and, indeed, if it were a ball, anyone starting at the top of it, and walking too far in one direction, would soon find himself beginning to slip—just as a doll might slip off an orange—until at last he would tumble off altogether, and that would be the end of him. It seemed a great puzzle, or, rather, it seemed not a puzzle at all; it simply seemed that the people who said the earth was a ball were talking nonsense.

But these people would not stop talking, and they went on with one argument after another so strongly that at last people believed that what they said was true. One of their best arguments was that if you watch a ship as it sails out to sea from the harbour, it does not behave as it should behave if the sea were flat. Suppose the sea were like a flat, ploughed field. You could watch the ship go up and down and on and on, looking smaller and smaller, until at last it became just a speck, and then disappeared

out of sight. But that is not at all what happens when a ship sails out to sea. If we watch it closely, we find that it begins to disappear in a particular way. The *hull* — that is, the bottom — of the ship disappears first, and then the ship seems to sink lower and lower, until we can only see the tops of the masts, and then only the top of the highest mast, and then nothing at all. When it has quite gone, the ship is really near enough for us to see quite well, but it is hidden by something—something which first hides the lowest part, and then hides it all.

How the ship comes into sight at sea

Then, supposing the ship comes back, what do we see? Is it, first of all, a sort of dim shape, which gradually becomes clearer and clearer, like a man meeting us in a street in a fog? Not at all. The ship seems to rise up from somewhere, and, as it rises, comes nearer and nearer, so that we see the tops of the masts first and the hull last. What happens is exactly the same as what happens when we stand half-way up a little rounded hill, and a friend leaves us, going over the top until we can only see his head, and then nothing at all. Then the friend comes back to us over the hill, his head appearing first and his feet last. It is the same with the ship. Exactly the same thing happens in each case. The ship has gone round the corner, so to speak, though it is *over* the corner rather than *round* the corner. We cannot see it because the earth itself (it happens to be the sea, but that does not matter) is between us and the ship.

The first men who tried to sail around the great earth-ball

"Very well, then," said some bold sailors. "Very well, then; if the earth is really a ball, and if there is water enough, we shall sail around it. We shall start out from the edge of the land with our best boats and a big supply of food, and we shall go straight on and on and on, though we see nothing but water in front of us; and if you are right, and if we sail long enough and our food does not run short, we shall go right round the ball and turn up again at the place we left"— not at the same edge of the land, but at the opposite edge.

And that is what these sailors tried to do. They went out in their best and biggest boats; they turned their boats straight ahead, and waved their hands to the crying friends who thought they would never see them again. The country called Spain, which was at that time one of the most famous countries in the world, was their starting place. On they went, and we may imagine how often those sailors, who could not believe this story about the earth being round, wanted to turn back and go home again. Every day they felt they were sailing further from their homes, and what way back could there be except the way they had come?

But there was to be no turning back. Each day their leaders gazed ahead, looking for land—land that had never been seen, but which they hoped to be the other side of the land from which they had started. And once they nearly found what they were looking for. It was not a great stretch of land that they saw, only some small islands, but that was quite enough, they thought. Where there were islands, they said, there would surely be land beyond them.

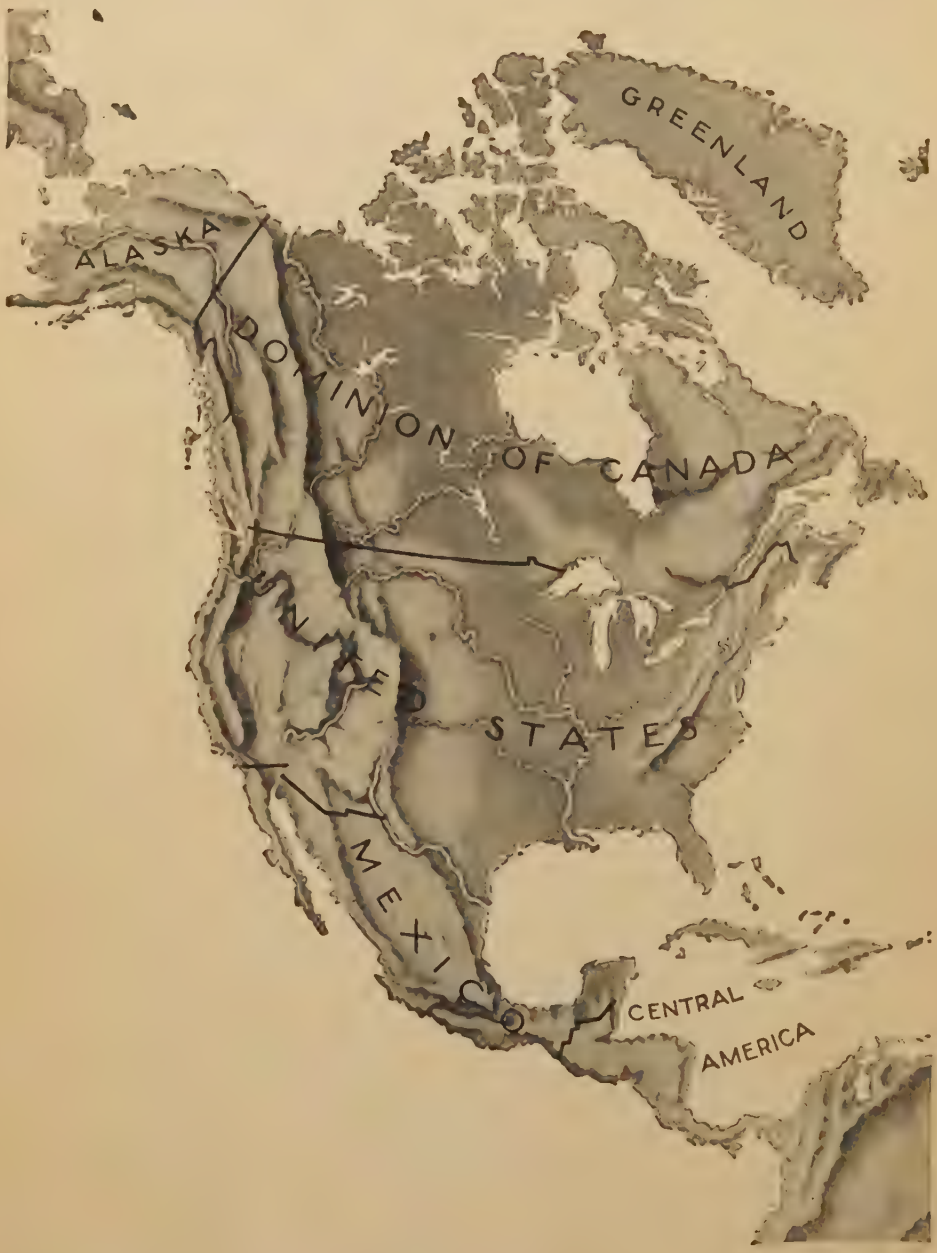
How men found that the earth is a great ball

Now, in those days, people who lived in Spain, and in that part of the world, used to call the land which lay furthest East from them the Indies—it is the same word as India. So when the sailors came across these islands, they thought that, by going round the other way, they had reached some of those same Indies which they had visited before by traveling East, and they called these islands to which they first came the *West Indies*, and the Indies they had left behind them they called the *East Indies*. Little did those bold sailors guess that instead of going all the way round they had gone only a quarter of the way. But they had done one great thing. *They had gone out West across the sea, and had found land.*

This was the beginning, and a great beginning. Soon there followed other sailors, equally brave, and at last they succeeded in sailing right round the earth. That was the end of the notion that the earth was flat. These voyages discovered for us what we still call the New World, and they have been of great importance to the lives of all of us. But their greatest importance was really to prove for ever that this wonderful earth is nothing else than a great ball.

THE NEXT STORY OF THE EARTH IS ON PAGE 85.

THE SURFACE OF NORTH AMERICA



This map of North America shows the land itself with its streams and mountains. You can recognize the four great slopes of which you are told. Notice the narrow slope down to the Atlantic Ocean, the great plains in the Mississippi Valley, the Rocky Mountains, the great highland west of them, and then the Sierra Nevada and the Coast Range. You can understand from this map how far down the ice sheet came, and how far up into the land the Gulf of Mexico once reached. You can see also how like and yet how unlike the United States is the surface of Canada and of Mexico. A study of the surfaces of a country helps one very much to understand its settlement and its history.

From the Natural Introductory Geography, copyright 1897, 1907, by the American Book Company.

THE HISTORY OF THE UNITED STATES

IN this story and those that are to come after we are going to tell you the story of the United States from the earliest times of which we know anything down to the present. If you read it carefully the editors hope that you will not find it dull and that you will find many things that you will be glad to know. In this story we shall learn what part of the land first rose from the sea, and something of the plants and animals that lived in the old days. We shall learn that a great part of our country was once covered with a sheet of ice over a mile thick, and we shall be told what it did. Then we shall learn something about the strange men that the white men found when they came.

THE LAND BEFORE THE WHITE MAN CAME

By Holland Thompson

HAVE you ever thought about what this country of ours was like before there were any white men here? You have all heard that Columbus discovered a little island near the coast of North America in 1492, but that is only something more than four hundred years ago, while our country is millions and millions of years old. You all know that you live in the United States and are proud of the fact, I am sure. You have heard your father say that another man was a good citizen and you knew that it meant something pleasant. You boys and girls too want to be good citizens. Now in order to be good citizens, you must know something about the great country in which you live, for an ignorant man cannot be a very good citizen. Citizens have something to say about how they are governed and unless you know something about what has happened in the past, how can you tell what is best now?

Now look at the rather queer map of our country which is printed with this article. On it towns, cities, railroads and other works of man are not shown at all, but only mountains, rivers and plains, all the work of Nature. This is called a relief map and is interesting for many reasons. In another part of our book you will learn how mountains and valleys affect rainfall and climate and upon these two men's success upon the earth depends. In a climate which is too hot or too cold, too wet or too dry, men cannot work well.

On this map you will see that the rivers and smaller streams even in the same neighborhood run in different directions, but if you look more carefully you will find that generally their water reaches the same place. This is not always true, however. Sometimes the water of springs which are only a few yards apart finally enters the sea hundreds, or even thousands, of miles apart.

Perhaps some of you have been to Asheville among the mountains of Western North Carolina. If so you remember that the train stops just after it comes out of a long tunnel through a mountain, and beside the railroad you will see a little spring tumbling down the mountain side. Throw some bits of paper into the stream and watch them. Soon the stream divides, some of the paper is carried east and some is carried west. The water that flows west will finally reach the Gulf of Mexico, while the other little stream finally reaches the Atlantic Ocean.

THE GREAT DIVISIONS OF OUR COUNTRY

Our country has only four great slopes, one toward the Atlantic, one toward the Gulf of Mexico, one toward the Great Lakes on the north, and one

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toward the Pacific Ocean. The Great Lakes finally empty into the St. Lawrence River and this great river flows through Canada into the Atlantic Ocean also. All the land in any one of these slopes is not alike, and the climate and the soil also may differ very much, but still all these are generally more alike than they are in the other great divisions of our country.

Suppose we could fly in a gigantic aeroplane from the Atlantic to the Pacific, what should we see?

Let us start about the middle of our Atlantic coast, so that we shall pass over Washington, our capital city. First, there is a stretch of low, level land raised only a few feet above the level of the sea. There are many streams which flow very slowly. Sometimes in fact they seem to flow away from the sea instead of into it as the tides from the ocean rush in and push the stream back. This stretch of land is called The Coastal Plain. Going further west we see below us hills and valleys through which the streams flow quite rapidly. In many of the streams are waterfalls, when the streams suddenly drop from a higher to a lower level and there are many factories. This region is called the Piedmont Plateau. (The word "Piedmont" means "at the foot of the mountains.")

THE HIGHEST MOUNTAINS IN THE EASTERN UNITED STATES

Sailing steadily westward, we find that our machine must rise higher in the air for we are coming to mountains covered with forests. These mountains are not so high as some we shall see farther to the west, but still many points are more than a mile high. The highest are Mt. Washington in New Hampshire to the north of us, 6293 feet high, and Mt. Mitchell in North Carolina to the south of us, 6711 feet high. Most of the peaks are much lower, however, and we shall learn more about them later. In these mountains many rich mines of coal and iron are found.

Crossing these mountains we again see hills, but soon we reach the low level prairie region, in which are the most fertile farms of the United States. There are fields of corn and wheat which extend for miles. We see herds of fat cattle and many pigs which will give us beef and bacon. This is one of the finest farming regions in the world, but it has many cities also. On we go, mile after mile, until we reach the great Mississippi River, one of the greatest rivers in the whole world.

Beyond the Mississippi are the same low plains with their fertile farms, but finally the ground begins to rise again. The land no longer seems so green, farms are fewer, but we may see half-wild cattle wandering about grazing on the short grass. At length we come to a region which is called the Cordilleran Highland. First there are the Rocky Mountains on the east, then a high, rocky, hilly region with little rainfall, and then the Sierra Nevada Mountains and the low Coast Range still farther to the west. Some of these mountains are very high. In the state of Colorado are thirty peaks each of which is more than two and a half miles above the level of the sea. Through this region are rich mines of gold and silver, and other metals, hardly less valuable. Then the country slopes down to the Pacific Ocean in a region of abundant rainfall where farming of every sort flourishes.

If we were to cross the land further north or further south we should not find exactly the same sort of land, occupations or people. For example, further north, in addition to the mountains we should pass over thousands of lakes, some large, some very small. We should see hundreds of factories and many cities in the eastern half of the country. If we crossed much further south, there would be fewer lakes, fewer cities, and fewer factories, but we should find cotton, sugar cane and oranges growing, and we should find almost no hills at all until we reached the far west. Somewhere in the United States we can find almost every kind of soil, climate and product. Plants which belong to the Arctic Zone grow in the high mountains of New England, and in some parts of Florida, California and Louisiana the summer lasts the whole year round. Some of our country is wet and swampy all the time, but another part is a real desert. However, both swamps and desert are growing smaller, for men are draining the swamps and bringing water to the desert.

PALISADES OF THE HUDSON

The Palisades of the Hudson extend northward from Fort Lee, New Jersey, about fifteen miles along the west bank of the river. These rocky cliffs, 300 to 500 feet in height, are entirely unlike the other rock of the neighborhood. Many centuries ago the crust of the earth cracked, and these huge masses were forced up because of the great heat below. They cooled quickly and took the form which we see.

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DESERT AND SWAMP IN THE UNITED STATES

Compare these bare mountains of Arizona with the wooded range of New Hampshire shown in another volume. So little water falls that only shrubs grow. The men have come to get water from the hole or "pocket" in the rock. Possibly there is no other water to be found for many miles.

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Much of Southern Florida is a great swamp called the Everglades, which has not yet been drained, or even entirely explored. Vegetation is very luxuriant, as the rainfall is abundant, and the climate warm and moist, and the soil very rich. Snakes, alligators and other unpleasant things are found.

THE UNITED STATES AS IT WAS MANY, MANY YEARS AGO

Such is the United States to-day. But it was not always so. The wise men tell us that millions and millions of years ago, water covered the whole face of the land. Then the crust of the earth wrinkled and folded as you may read in the BOOK OF THE EARTH and two chains of islands appeared. These were the highest peaks of mountain ranges in the east and in the west. The lower parts of the mountains were still covered with water and all the central part of our country was an open sea. These were not the present mountains, as they are much younger, while the old mountains have been worn away. As the years went on, the land connecting the islands in each group was raised above the sea. Finally the land in the north central part of our country was raised, but what is now the Gulf of Mexico covered the southern part up to about the point where the Ohio River now joins the Mississippi, and further west extended into what is now Canada.

The gulf finally moved southward. One cause was the great quantity of sand and mud which the rivers carried down and they are still doing this. The Mississippi builds its delta out into the gulf a little farther each year. Life had appeared on the earth and for thousands of years plants grew and died until their decay made beds of vegetable matter many feet thick. The climate was not then as it is now. Those beds of vegetable matter which are now coal show that the climate of Pennsylvania was once hotter and wetter than it now is in Florida or Louisiana. An article in the third volume of our book tells you about this and shows what kind of plants they were.

HOW THE COAL FIELDS WERE MADE LONG AGO

But the level of the land changed and these beds of dead trees and ferns sank into the sea or into the great inland lakes, and were covered with mud many feet thick. Again they were raised and in this mud the same sort of plants again grew and decayed, and the mud was covered with many feet of black mould. Hundreds of years later they were again below the level of the water. In some parts of the country the land was raised and then lowered in turn for thousands and thousands of years and the layers of vegetation because of the great weight and heat became coal and the layers of sand and mud became rock. In some parts of our country there are many beds of coal one above the other with layers of rock between them.

The land is still changing to-day. The sea tears away some coasts and builds up others. The rivers cut away their banks, and hills and mountains are being worn away. But other changes more important than these are also taking place. Men who study such things tell us that the coast of New Jersey is sinking about two feet in a hundred years, and that some day the land where towns and farms now stand will again be under the sea. The land in Canada toward Hudson Bay is rising, and some day, hundreds of years from now, the water in the Great Lakes may possibly find its way into the Mississippi instead of the St. Lawrence, thus leaving Montreal and Quebec inland cities.

VOLCANOES ONCE WERE COMMON IN THE WEST

The mountains which were raised above the sea began at once to wear away because of the action of water and air, heat and cold. Wise men tell us that some parts of our eastern mountains were once at least five miles higher than they are now. The western mountains are younger and have not worn away so much. On the contrary, some of these western mountains are still growing. In the west too are many mountain peaks which are dead volcanoes. The states of Washington, Oregon, Idaho and parts of California and Nevada were once almost entirely covered by the lava from these volcanoes. Mt. Hood in Oregon and Mt. Shasta in California are fine examples of dead volcanoes. In Alaska there are to-day live volcanoes, which throw out ashes. As the lava decays it sometimes makes a very fertile soil and this is one of the reasons why Washington and Oregon grow such wonderful crops.

SOME ANIMALS WHICH ONCE LIVED IN AMERICA

Queer animals lived in the country. Some were larger than any animals now alive. Another article tells you about them. There were flying lizards, and lizards that walked. Much later there were great animals, like elephants, heavier than any now living, and great rhinoceroses, camels, and fierce tigers with long

teeth roamed the country. The mammoth and the mastodon, great elephant-like creatures, which are described in another place, towered above the other animals. A skeleton of a mastodon found near New York, showed that the animal had sunk in a swamp many thousands of years ago. In his mouth were some twigs which he had been chewing when the ground gave way beneath him. There were also huge buffalo with horns ten feet from tip to tip. When you are in New York, go to the Museum of Natural History and look at the skeleton of the Brontosaurus, a great creature like a lizard with a long neck and tail, which could easily touch the tops of tall trees.

THE VERY COLD TIME WHEN ICE COVERED THE LAND

Thousands and thousands of years passed with changes of climate. Once it had been much warmer than it is now. It became much colder. The United States was larger than it is now, since much land that is now under sea was then high above the water. All the islands around New York City were joined to the mainland and the Hudson emptied into the sea at a place now about eighty miles out in the ocean. At the bottom of the ocean its bed has been followed out. The climate became so cold that great ice sheets, called glaciers, covered most of Canada and much of the northern part of our country. You learn also the causes of glaciers in another part of our book and so we shall tell only a little of what this one did. This ice sheet was more than a mile thick in some places and covered all of New England and New York, except a little corner, much of New Jersey and Pennsylvania and in the Mississippi Valley crossed the Ohio River at one place. In the western part of the United States it did not go down quite so far. This glacier moved slowly, scooping off the soil, gouging out rock, cutting off the tops of mountains and carrying with it great heaps of earth and gravel. These heaps are called "moraines" and are still to be seen in many parts of the land though they are often covered with farms or trees now.

Much of the surface of Long Island was deposited there by the glaciers. The same may be said of Cape Cod, which some of our readers know is a delightful place to spend the summer. The island of Martha's Vineyard is almost entirely a moraine deposited there ages ago. Stones belonging in many other parts of New England have been found there.

Some one has said that the glacier was a combination of a huge file, a great plough and a mammoth dump-cart. The scratches and grooves made by the rubbing of great rocks upon each other can be seen all over New England and many of the huge boulders lying in the fields were brought from hill tops hundreds of miles away, and as the ice melted were dropped where they now lie. Perhaps you have seen the Rocking Stone in the Zoological Gardens in Bronx Park, New York City. This is a boulder which has been brought from far away and left so delicately balanced on an old hill top, that a child can move it, though it weighs many tons. There are stones very much like it all over the region once covered by this great ice sheet.

HOW THE ICE SHEET MADE THE LAKES WE LIKE SO MUCH

Another effect of this great ice sheet was to make most of the beautiful lakes in the northern part of our country. If you look at a map you will see that there are very few lakes in the southern part of the country while there are thousands in the north. More than ten thousand lakes or ponds have been counted in the state of Minnesota, alone, and there are thousands more in New England and New York. Nearly all of these are the work of the great glacier which once covered the land. Even the Great Lakes, Superior, Huron, Michigan, Erie and Ontario, are due to this cause, and so is Long Island Sound.

These lakes were made in three ways. Sometimes the ice sheet dumped great masses of the rock dust upon the land, leaving hollows and ridges. Water collected in the low places or when it sank into the ground came out again in the form of springs which ran down into the pond or lake. Sometimes the glacier, slowly moving down a valley, carried with it a great mass of clay and gravel. When the ice sheet finally melted and disappeared the valley was left with a dam across it and behind it the water has collected. Sometimes the great weight of ice and stone scooped out holes in the softer stone over which it passed and these holes have become filled with water and are fed by the little streams in the neighborhood.

The course of many streams was

changed by the dams built by the great glacier. Since they could not run in the old channels they cut new ones for themselves. Sometimes they ran over hard stones which could not be cut so readily. So the water jumps instead of having a sloping bed. Many of these falls which have helped to make New England such a great region for factories, mills and shops are where they are because the course of the river was changed by the glacier. Even Niagara Falls, one of the great wonders of the world, exists because of this fact.

The ice sheet finally melts and great floods come

All the changes which came because so much of our country was once covered by this great moving covering of ice, can not be told here. Many large books would be required to tell you even a small part of them. We do not even know how long the ice sheet lasted. It must have been thousands of years, during which time the great ice sheet sometimes advanced, sometimes stood still, then advanced again, and sometimes drew back, as the ice melted faster than the newer ice was supplied from behind. Finally the climate again changed, the land was lowered and the ice melted away. Then the land was raised again until the continent became very much as it is to-day. All of this happened a long time ago as men count time. It has been at least 5,000 years, probably as much as 10,000, since the ice sheet disappeared, but as the wise men who study rocks and mountains count time it is only a little while. Geologists, as such men are called, count time by centuries, instead of by days as we do.

The change of climate which produced the ice sheet, put an end to many of the queer animals whose bones are found sometimes buried deep in the earth. Others could no longer find the food they liked, and died. All life depends principally upon food supply. This is a fact to be kept in mind. When the white men came, many animals, some very much like those to be found in Europe, lived in the forests or on the plains. But on the other hand many animals now common in this country do not belong to North America at all but were brought from Europe by the first explorers and settlers. The same thing is true of many of our common plants.

Animals found in America unknown in Europe

The bison or American Buffalo was one of the most important animals belonging to America. It chiefly lived on the western side of the Mississippi River, though a few were found by the white men east of the Alleghany Mountains. Perhaps you have seen these animals in a zoological garden in some city, though they are not common. Once there were thousands and thousands of them, and they began to grow scarce in the West hardly fifty years ago. A few small herds are left. The turkey is a fowl which was unknown in Europe until it was brought from America. Some of the plants were strange also. Tobacco was unknown to the Old World until America was discovered though it is now used as much in Europe as it is in America. The tomato and the potato are also American plants, while the Indian corn and pumpkins were also unknown to the Old World.

America, however, did not have any of our common domestic animals, except the dog. The wild horses which only a few years ago were common on the western plains were descended from the Spanish horses which escaped from their owners and ran wild. Our domestic cattle were also brought over from Europe, and the same may be said of the hog and the chicken. Though there is a wild sheep among the Rocky Mountains, the sheep from which we get our clothes and our food was brought over by the white men.

Man appears in America

We do not know when men first came to America or where they came from. It was before the ice sheet had entirely gone, but men who have studied the matter do not agree how long. Possibly they came over from Asia through Alaska and then down until they spread over North and South America. It is possible that Alaska was then joined to Asia and they came over the land. Perhaps they used rude boats made of skins, or of trees hollowed out. Some men believe that Europe and America were once united by a narrow ridge of land, which could be crossed, but it is not probable that they came this way. We know that the first white men led by Leif, the son of Eric, who came over from Greenland about the year 1000, found red men in possession of the country, and the description which

they left of their life and habits is very like that of those explorers who came five hundred years afterwards.

The story of the Norse explorers under Leif had been lost, and when Columbus reached land he thought he had reached Asia. Therefore, he called the natives Indians, and by that name they are generally known to-day. Some writers, however, have made a new word from parts of the two words American Indian and call them "Amerinds." This is a very good name but it has not come into common use, for when people have been using a name for hundreds of years it is difficult to get them to change.

What were the Indians like?

Now what were the Indians like? All had reddish or cinnamon colored skin, high cheek bones, black eyes, and straight black hair which the women wore long. The men shaved all of their heads except one lock called a scalp lock to which they sometimes tied feathers. Few had any beard at all though some men had a few hairs which were often pulled out by the roots. In all other ways different tribes were often much unlike. Some were tall and slender while others were short. Some were gentle and peaceable, but others were fierce and warlike; some were trustworthy, others were deceitful; some had learned a good deal about farming and building, others seemed little wiser than beasts. One must describe the tribes separately.

Students of the Indians have tried to divide them according to height, color, manners and customs and the like. They think now that the language is the best test. If you look at a page of Dutch and a page of English you will see that many words are something alike. This is because the old English and the Dutch are related in blood. A study of the languages of different tribes of Indians shows that some of them have many similar words, and the wise men say that these tribes are related though they may have lived a long way apart. The students of Indians say that there were fifty-five different families or "stocks" of Indians in North America. Some of these have died out and only a few of the remainder are important. Different stocks differed very much in many ways.

The lowest class lived west of the Rocky Mountains. They lived almost entirely by hunting and fishing and planted little or no land. They knew how to make baskets, but did not make pots, and lived in tents called wigwams made of skins sewed together, which they moved very often. Some of the Apaches have not changed their habits much to the present day.

The Indians who were partly civilized

South of them, in what is now New Mexico and Arizona, were Indians of a higher class. They are usually called Pueblo Indians, because they lived in a sort of fort built of brick or stone and called a pueblo. These pueblos were built like great apartment houses and sometimes held several hundred families. Some of them lived close to the Apache Indians, whom they feared very much, and so they often built their houses on the side of a cliff so that they could be reached only by ladders. They cultivated fields of corn and brought water in ditches from the hills to make it grow. They made baskets so closely woven that they would almost hold water, wove good cloth, and made jars and pots of clay which were strong enough to stand great heat. They built temples in honor of their gods, and some of the tribes used bronze tools and weapons, though stone was more common. The chief tribes now in the United States are the Moquis and the Zunis, but they are few compared with their former numbers. In the picture you can see the ruins of a town built against and in a cliff. This could be reached only by ladders which the Indians would pull up after them.

The Indians of eastern America and their food

East of the Rocky Mountains the Indians were between the two classes in civilization, but they were not all alike, for some tribes had learned more than others. They got most of their food by hunting and fishing but they got some of it from the soil. They had learned how to kill the trees by cutting off a ring of bark around the trunks or else they burned them down. They scratched the ground among the dead trees or the stumps with a stone hoe, or with a flat bone of a deer or a buffalo, or with a stick sharpened in the fire. Then they planted corn and pumpkins, or squashes, and sometimes beans, sunflowers and tobacco. Of course the crop was small with

such poor tools, as the ground could not be broken up so that the roots could get food enough from the soil. We are told that some of the Indians of Massachusetts had learned that they could get larger crops if they put a dead fish or two in the hole where they planted the corn, but not many tribes seem to have known this.

The corn and the sunflower seeds were pounded between two stones. Sometimes they found a hard stone which already had a hole worn part of the way through it by water and used it to hold the corn while the women pounded with a smaller stone. They mixed the coarse meal with water and baked the cake in the ashes. When they were making a journey they parched the corn and then pounded it up. In this way they could have something to eat, without lighting a fire. The smoke of a fire might have shown their enemies where they were and have been a cause of great danger.

They made pots of clay, but as they could not make them strong enough to stand the fire, they often cooked their food by heating stones red hot and then putting them into the water. Sometimes they dug a hole in the ground and lined it with smooth stones. Then they built a fire in the hole until the stones were very hot. The ashes and coals were then cleaned out and shell-fish, green corn and game were put into the hole and covered with grass or seaweed. If you live on the seashore perhaps you have helped in a clambake, prepared in the same way. Things cooked in this way are so good that one would almost like to turn Indian. Sometimes they cooked meat by hanging it before a fire until it was done, or by broiling it on the coals.

THE EASTERN INDIANS DID NOT HAVE OUR COMMON METALS

The eastern Indians did not understand the use of metals when the white men came, except that some tribes wore copper ornaments. Their weapons and tools were all made of stone. Some of the arrowheads are very beautiful and some of their axes were made of highly polished stone. You can see some of them in any museum, and in many parts of our country they are sometimes ploughed up by farmers or are found when digging the foundations for houses. The arrowheads were fastened to the arrows by the tough sinews of the deer or other animals, and they also used these sinews to sew skins together. For needles they generally used small sharp bones. The Indians wore very little clothing. which was generally made of deerskins. All wore shoes called moccasins made of soft skins which made very little noise as they moved through the woods. When they went to war they painted their bodies and faces to frighten the enemy.

So far as we can judge the Indians had made little progress during the thousands of years they had lived in America. One great reason for this was the fact which was told above, that our common domestic animals were not found in America. Without horses, cows, sheep, pigs and chickens it was hard to cultivate the soil or to get enough animal food. Another reason for their lack of progress was that they did not know how to get metals from the earth. Stones and flat bones are not good tools.

THE EASTERN INDIANS LIVED IN HOUSES INSTEAD OF TENTS

Many of the eastern Indians lived in houses made of bark or of branches of trees woven together with skins or clay. Sometimes they lived in the same houses for years, but often they left them when the summer came on, and the game moved away. Often several families lived in one house, which was then arranged like a stable and each family occupied a stall. All these families were supposed to be related, but they did not count themselves related on the father's side but on the mother's. That is, all living in the house said that they were descended from the same woman. Those who were related made up a clan and the clan was known by the name of an animal, such as the Bear or the Wolf or the Turtle. They painted pictures of such an animal, or made an image of wood or stone and called it a Totem. The picture of this animal was often painted on the breasts of men so that it would not come off. A large clan would live in several houses.

A number of clans made a tribe, which was sometimes small and sometimes large. From the old men in every clan, a ruler called a "sachem" was elected, but his son did not always succeed him. The sachems from the clans met together, made rules for the tribe and punished those who broke them. Each clan elected a war chief who led the warriors in battle.

Some tribes also elected a head war chief. Generally every tribe was jealous of all other tribes and was on unfriendly terms with them, if not actually at war.

THE INDIAN IDEAS OF RELIGION AND OF SICKNESS

The religion of these Indians was curious. They worshipped their dead ancestors, the Sun, the Winds and the Lightning. Since the lightning in the sky looked something like a moving snake, they respected the snake and many tribes would not kill one. Some of them believed in a Great Spirit, but they thought also that every man, every hill, tree, lake and animal also had a spirit. Some of these were good and some were bad. Some would help man and some would hurt him. A man was sick because an evil spirit had entered his body. In every tribe were "medicine men" who were supposed to have power over bad spirits. So they would go into the house or wigwam where the sick man lay, and shout, scream, shake a rattle, and say some magic words which they said would drive out the evil spirit.

If the man or woman died in spite of the medicine man, the body might be placed high in a tree, where it would be safe from wild beasts. Some tribes built scaffolds and placed the bodies there, while others put their dead into huts or caves. Often they buried them in the ground and heaped a great mound of earth over them. These mounds sometimes covered many bodies. With the body they sometimes buried weapons, food, and drink, which they thought would be of use in the next world. With a little child a dog was often buried, so that it might have help in finding its way in the spirit world.

SQUAWS NOT SLAVES OF THE MEN AS YOU HAVE BEEN TOLD

You have perhaps been told that the Indian woman, who was called a squaw, was the slave of her husband. This is not quite true. She had her work and he had his. It was his business to chase the game, sometimes many miles, and it often happened when game was scarce that he might be away for days or even weeks. He fought the bears and other wild beasts and sometimes was dangerously hurt. He made weapons and had to be ready at all times to use them. The women did the work about the hut, cultivated the ground and made the clothes. In short, the man did the work belonging to war and hunting, while the women had to do with peace. When the clan or tribe was moving the woman carried most of the baggage, but the man had to be on guard, for an enemy hidden behind a tree might at any time send an arrow toward them. The Indian seldom spoke crossly to his wife and children, and when they were safe from enemies and there was plenty of food played games with them. The young men were very fond of games. The game of lacrosse which you may have seen played was an Indian game which our college boys have borrowed.

CHILD LIFE AND EDUCATION AMONG THE INDIANS

The Indian baby was called a papoose. He had no crib like the one you used, but as his mother was too busy to hold him in her arms he might be strapped to a board and hung in a tree, or against a post. When the mother was traveling she hung him on her back. When he grew larger he helped his mother gather sticks for the fire, or gather berries. He had a little bow and arrows and learned to shoot. He was taught to swim, to run, and to climb. He learned to track rabbits and to set traps for them and other small animals. When he grew larger he was taken on hunting trips, and at last to war. But not until he had killed an enemy and taken his scalp was he considered to be really a grown man.

The first years of the little Indian girl were spent in much the same way. But instead of learning how to shoot she learned how to prepare skins for moccasins or for clothing, and to sew tents. She learned how to cook and to cultivate the ground and in some tribes the women wove coarse cloth, and made baskets and pottery. She encouraged the boys and young men to be brave and fearless, and would not speak to one who seemed to be afraid of anything.

We have spoken several times of the fact that the Indians were so often at war. This frequently happened because of the fact that one tribe hunted on the ground that was claimed by another. You think of our country as having been full of Indians. This is not true, for when the white men came there were probably not as many Indians in the whole of the United States as there are now people living in Boston. Men who

INDIAN SCULPTURE AND BUILDINGS

This stone is supposed to be the work of Aztec Indians whom Cortes found in Mexico four hundred years ago. Notice how clearly and accurately the many figures are carved upon its curved surface. They are supposed to represent the captives in war of a great king of the Aztecs in the fifteenth century, named Tizoc. It was found in the City of Mexico, and a copy is in Washington.

Here are the ruins of a Pueblo Indian village now seen in the Canon de Chelly in Arizona. Notice that part of the village in the shelf of the cliff. If you look closely you can see some pictures drawn upon the face of the cliff. The vegetation in the foreground of the picture shows how dry and warm the climate is. There is so little rain that only a few hardy plants grow.

INDIAN PICTURES THREE CENTURIES OLD

Indians used small shells strung together for ornament and also for money which they called wampum.

Here we see Indians burning and scraping out the centre of a log in order to make a rude canoe.

Many eastern Indians lived in huts covered with bark or clay, and surrounded by a strong fence of poles.

have studied the subject say that when the white men came, there were not more than half a million Indians in what is now the United States. That means that there are now two hundred times as many people in the United States as there were four hundred years ago. There are not so many Indians now as there were four hundred years ago, but they have not died out so rapidly as people think.

Now a people who live chiefly by hunting must have a large territory, for game does not stay in one place like cows or sheep. Sometimes the hunter would go for days without finding anything, or if he did find it, a bow and arrow is not so good a weapon as a gun, and the deer often got away. So in order to get close to it he had to learn to move quietly and to learn to follow tracks. It is not true that the Indians had keener sight than the white men who lived the same kind of life. Some of the white scouts and hunters, as we shall learn hereafter, were quite as skilful as the Indians.

TORTURE OF CAPTIVES TAKEN IN WAR. THE CASE OF JOHN LAWSON

When captives were taken, sometimes they were killed on the spot, but generally they were taken back to the village. Women and children were spared to help the squaws with their work. Sometimes young men and boys were adopted into the tribe to take the place of warriors who had fallen in battle. More were tortured in various ways. Sometimes the captive was fastened to a tree and the boys and young men threw tomahawks at him trying to see how near they could come without hitting him, but his pride kept him still, for to dodge would have been considered cowardly. Finally, he was sometimes fastened to a stake, wood was piled around his feet and set on fire. As the flames grew hotter, he sang his death song telling how brave he and his tribe had always been. When the Indians captured white men they tortured them in the same way. In the early days of North Carolina they captured a surveyor named John Lawson, stuck his body full of pine splinters, which burn very fast, and then set them on fire. The Indians in Canada tortured many of the Jesuit missionaries who went out to preach to them. Hunters were sometimes tortured, if they were captured.

You will find the names of many Indian tribes as you read United States history but I shall give only a few of them now. The Indians east of the Rocky Mountains were divided into three great stocks, called the Algonquin, or Algonkin, the Huron-Iroquois, and the Maskoki or Muskogian. The last lived in the South and the principal tribes were the Chickasaws, Choctaws, Creeks and Seminoles. Their descendants now live chiefly in Oklahoma. The Iroquois lived in New York and the neighboring states, and the principal tribes were the Five Nations, the Eries and the Hurons. The Cherokees and the Tuscaroras, who lived in North Carolina and Tennessee, were also Iroquois. The Algonquins lived in New England, New Jersey, Maryland, Virginia and in the region further west.

Many tribes belonged to the Algonquin stock. They were seldom so fierce as the Iroquois, though some of them fought the white men to the last, or else moved west. The Delawares, Mohicans, Pequots, and Wampanoags were all Algonquins, as are the Cheyennes, Crees, and Ottawas.

THE FIVE NATIONS THE MOST POWERFUL OF THE EASTERN INDIANS

Of all the eastern Indians the Five Nations were the most advanced. They were so important that they are sometimes called the Iroquois, as if they alone had the right to the name. The tribes were known as the Senecas, the Cayugas, the Onondagas, the Oneidas and the Mohawks. Later when the Tuscaroras in North Carolina were defeated by the whites, that tribe moved to New York and joined the Five Nations, which were afterward known as the Six Nations. These tribes had settled homes from which they did not move and cultivated more ground than any other Indians. Some of them still live in New York State and in Canada.

In other chapters of the story of the United States we shall read how the Indians and the white men met and shall see that the white men often treated the Indians harshly, and how the Indians paid them back. Some of the Indians boasted that they never forgot a kindness and never forgave an injury. We shall see how the white men pushed the Indians back until now they have only a small part of the country, and are entirely surrounded by white men. Some of the Indians are citizens of the United States, and are making good records.

THE NEXT STORY OF THE UNITED STATES IS ON PAGE 271.

THE GREAT STEEL ARCH ACROSS LONG ISLAND SOUND

This picture shows the Hell Gate railway bridge over Long Island Sound, just before its completion. The distance between the smoke stacks of the steamer and the floor of the bridge shows its great height above the water. The bridge is part of a long viaduct, and the structure which you can see through the bridge is another part of the same viaduct. The beautiful curve which brings this part of the viaduct round until it is almost at a right angle with the bridge is in itself a great triumph of engineering. This bridge is nearly a quarter of a mile long between the piers. The arch is the longest steel arch in the world.

One of the most wonderful bridges in the world, across the River Forth in Scotland.

FOOTPATHS IN THE AIR

NO one can say who built the first bridge. Nature herself would no doubt be man's first teacher. Man would find a path across a chasm by clinging to a twisted vine; or he would see a ready-made bridge consisting of a fallen tree-trunk across a stream. Those were the first bridges, and they were the sort which would have to be made for hundreds of years.

One day a genius arose, who dumped high heaps of stone in a line across a stream, and on the top placed slabs of slate or stone or fallen trees. Then, a long, long while afterwards, came bigger, real bridges. The Romans were the first to learn how to make these. They built splendid bridges on arches, some of which exist to-day.

Men had a long time to wait before they got good bridges in England. The twelfth century had almost ended when the first great London Bridge was built. There were wooden houses and shops on it, but these were always catching fire and damaging the bridge, and they were all pulled down before the bridge was destroyed.

A great reform was made in bridge-building by John Rennie. It had been customary to make the arches very high, so that when a bridge had only one arch the roadway sloped sharply up on one side, and down on the other. But John Rennie made his arches, not like the half of a circle, but like the half of an egg cut lengthwise.

There still exists a famous single-arch bridge of the old type, the famous bridge at Pontypridd, in Glamorganshire. The first bridge there had three arches, but the river washed them away. Then the builder, William Edwards, put up another in its place, but it had only one arch, and soon fell.

Edwards discovered the cause of its fall. There had been too much weight on the supports, and not enough in the centre. By being too light on top, the crown of the bridge was forced up and made to fall. Then he built a third bridge, in which the haunches were lighter and the top heavier. That bridge still stands, after being used for more than 150 years.

When the eighteenth century was drawing to a close, men began to build bridges of cast iron. But engineers soon found that, though cast iron can bear great pressure, it will not bear much *pull*. It cannot be easily crushed by a weight, but it can soon be snapped by weights which pull at the two ends. So they then used wrought iron, which cannot easily be pulled apart. That served until steel came into use in the nineteenth century.

The first great bridge built of wrought iron was the Britannia Bridge, which crosses the Menai Straits in North Wales. The builder was Robert Stephenson, of whom we read elsewhere. He made a huge square tube of iron—iron at the top, iron at

the sides, iron at the bottom, and through this tube of iron the trains pass. To increase the strength of the bridge he made the iron at the top and bottom tube-shaped instead of solid, because it would better stand the pull of the weight.

THE GREAT IRON TUBES IN WHICH THE TRAIN CROSSES THE WATER

These tubes are built on huge columns of masonry, one being founded on an island half-way across the water, and the others on the land at the sides. As ships were constantly passing, it was impossible to put up great scaffolds on which to build up the ironwork. So Stephenson had the two tubes, nearly 500 yards long, built in four sections on shore. When all was ready the big tubes were floated on many boats, and ferried out to the towers.

As the tide went down the boats gradually sank, and the tubes, weighing 5000 tons each, came to rest in grooves prepared for them in the masonry. Then the boats were drawn away and the enormous masses of iron were hoisted up to the proper height, 100 feet above the water by great engines.

One of the finest of all bridges is the great steel cantilever bridge. A cantilever is copied from the oldest of simple bridges. If two trees lean over the water from different sides of a stream, we have only to run a plank from the end of one trunk to the end of the other to make a simple cantilever bridge. That is one way of applying it. The other is to consider the cantilever a bracket. Secured firmly at one end, a bracket will bear a shelf with a heavy weight of books, and the steel cantilevers forming a bridge are merely huge brackets. The best example is the great Forth Bridge.

HOW THE GREAT FORTH BRIDGE WAS BUILT

There had been many schemes for bridging the River Forth, and at last the work was begun by Sir Thomas Bouch, who had built the famous Tay Bridge. But suddenly, one dreadful night in the winter of 1879, part of the Tay Bridge was blown down, carrying with it into the river a trainload of people. Everybody in the train was drowned and the country was horrified. Sir Thomas Bouch died broken-hearted and the Forth Bridge was designed by Sir John Fowler and Sir Benjamin Baker.

They had to cross two swift channels of water. There is an island in the middle, but on each side of it there flows a channel of water deep and swift, and 1700 feet broad. It was impossible to sink piers in these channels, so the central pier was founded on the island, and two others built nearer the shores.

The cantilevers, of which there are three pairs, carry the bridge across the two wide stretches of water. They are each 1360 feet long, and the three, stretching out towards each other, leave a space of 350 feet to be covered between the ends of the first and second, and a similar space between the ends of the second and third. Here ordinary steel girders are used. In order that ships may pass under it, the bridge is made 150 feet above high tide, and its top parts are 361 feet above the water.

The Forth Bridge has been surpassed by the bridge which has been built across the St. Lawrence River, near Quebec. This cantilever bridge has two great arms, each 580 feet long and very strong, which carry between them the weight of a central span, 640 feet long, at a height of 150 feet above high water.

HOW KITES AND ROCKETS ARE USED FOR BUILDING GREAT BRIDGES

The best suspension bridge in England is at Clifton. This is 702 feet across, and 31 feet wide. It is more than 200 feet above the River Avon, and it is said that the first string attached to the rope which pulled across the cable was sent over by a kite.

A still stranger way was adopted for starting the great bridge across the River Zambesi, in South Africa. The bridge is the highest in the world—400 feet above the water, and runs from cliff to cliff; so they had to fire a rocket fastened to the end of a cord. The rocket took the cord across, the cord was used for hauling across a wire, and the wire was used to pull over a small cable. On this a truck crossed carrying the main cable of the bridge, which is 200 yards long, and the greatest engineering wonder in South Africa.

The Tower Bridge, in London, is 800 feet long. When a ship is too high to pass under, great machines cause the roadway to open in the middle. The two halves are pulled up, working on enormous hinges, and the ship passes through.

The great city of New York has many bridges, but those that we know best are the four built over the East River, the stretch of water which separates Manhattan Island, on which the centre of the city is built, from Long Island. Of these four bridges the most famous, and indeed one of the most famous bridges in the world, is the one known as Brooklyn Bridge.

How the famous Brooklyn Bridge was built

This bridge was commenced by Mr. J. A. Roebling, who built the first suspension bridge over Niagara River. He was the first man to use wire cables, instead of chains, to suspend a bridge, and he used this plan for Brooklyn Bridge. Thousands of steel wires were used in each giant cable, by laying them parallel with one another over the tops of towers built on the land. The wires were clamped into nineteen strands for each cable and each strand contains nearly three hundred wires. The strands were then wrapped round and round with steel wire, to bind them into a cable, and at the same time form a flexible covering. The combined strength of the wires in four cables is sufficient to give the great structure strength to stand up under the strain of the enormous traffic that daily passes to and fro across it on electric trains, street railways, motor cars, and on foot. After Mr. Roebling's death, his son finished the bridge, whose airy grace gives little hint of its immense strength.

There are two other suspension bridges across the East River, and one of them, the Williamsburg Bridge, is peculiar because instead of being covered by a winding wire, the wires of which the cables are formed are clamped together at regular intervals by bands of steel, from which the suspenders which support the roadway are hung. The sections made in this way are covered by steel plates which overlap like armor. The Manhattan Bridge, which is also a suspension bridge, is longer than either of the others, but is not so interesting.

The Queensboro' Bridge is a cantilever bridge, which is noted for the fact that the cantilevers do not carry a suspended span, but, as it were, lock arms over the water. This is possible because the engineer was able to build two piers on an island in the river.

A great steel arch which carries a railway

Another great bridge in New York is a railway bridge, which is part of a long viaduct that carries a railway from Long Island, across two islands in the river, and on to the mainland. The bridge itself is an immense steel arch, which spans a distance of a thousand feet across, and carries four railway tracks 140 feet above high water. We gain some idea of its size when we are told that it cost over $10,000 to drive in the rivets that hold its beams together. These beams are seven feet across; some are ten and a half feet deep.

Naturally the towers which have to stand up against the push or thrust of all this weight must be very strong, and so we are not surprised to learn that they are 140 feet one way, and over 100 feet the other, and that their foundations are over 100 feet deep. From these towers the wonderful arch springs out and up, and at the crown is 300 feet above the water. It looks quiet and peaceful up there against the sky, but it is all the time pushing against the towers, as if two giants were thrusting 15,000 ton weights against them in an effort to overthrow them.

This bridge was built by the cantilever method. The sides of the arch were built out bit by bit across the river, until only one section on each side was needed to close it. Then the sections for the lower chord of the great bow were floated underneath it on barges; the derricks let down their long ropes, pulled the heavy beams up to their place, and held them there while powerful jacks bent down the great structure the few inches that were needed to meet the beams. The men drove in huge bolts to pin the parts together and from that moment the arch was self-supporting and no longer needed the aid of the frames that had been built on land to balance it.

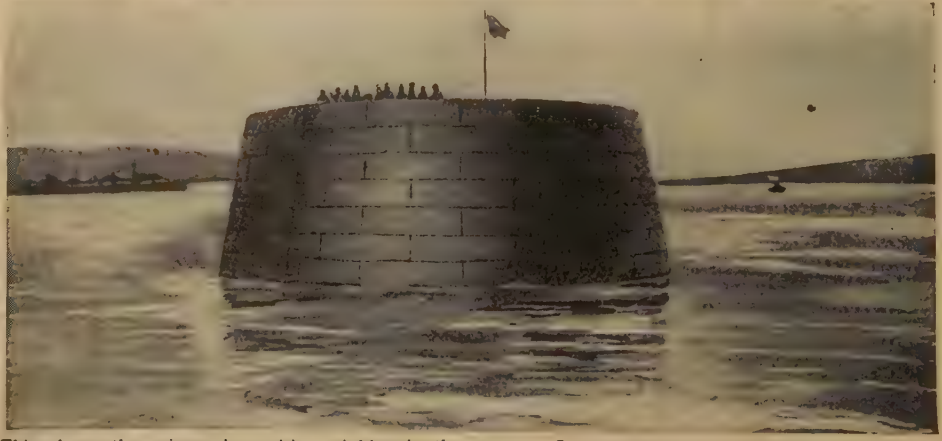
Instead of running along on top of the arch, the roadway of this bridge runs underneath it. Heavy girders are used to suspend the roadway from the arch, and these not only carry the weight, but help to stiffen the whole bridge against the force of the winds that swirl down through the narrow end of Long Island Sound.

THE NEXT STORY OF FAMILIAR THINGS IS ON PAGE 70.

THE BEGINNING OF A GREAT BRIDGE

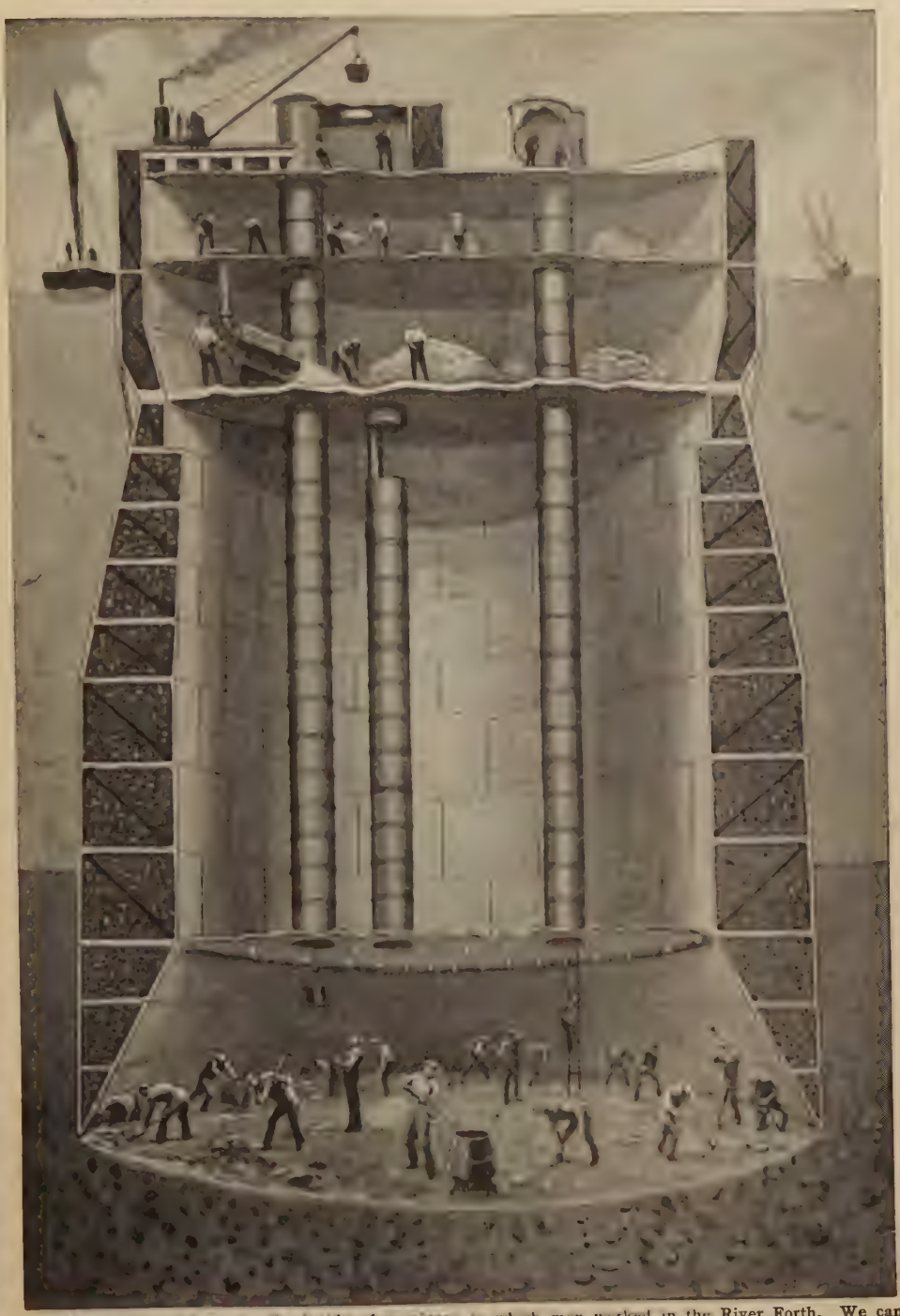
This shows us how the weight of a bridge is distributed; it illustrates the cantilever principle. These two men are sitting on chairs, each holding two sticks. The outside sticks are fastened to weights. The inner sticks are fixed to the chairs, and from their tops another stick is stretched, bearing a weight of 112 pounds. Yet the men feel no weight, and they represent two pairs of cantilevers.

This is a caisson, like a great hollow chamber, inside which men can work to set up the foundations of a bridge. The caisson shown here was floated into position for the building of the Forth Bridge. The huge steel tubes reached to the bottom of the water, and men worked inside them.



This shows the caisson in position, sinking in the water. It was about 70 feet wide at the bottom. Though open at the top, it had water-tight floors inside; at the bottom was a chamber 70 feet wide and 7 feet high, lighted by electricity, in which men, breathing air sent down in tubes, could work safely.

A GREAT WORKSHOP DOWN IN A RIVER



The picture above shows us the inside of a caisson in which men worked in the River Forth. We can see the tubes leading down from the top to the working chamber at the bottom. Inside one tube is a ladder by means of which the diggers climb up and down. Other men bring down material, and take up the broken rock which has been dug. Another tube brings down air for the men to breathe. If the bed of the river should happen to be muddy, the mud is forced away by compressed air. Water is kept out of the chamber by utilizing compressed air, which presses with very much greater force than the water.

THE FORTH BRIDGE PIECE BY PIECE

When the rock had been prepared for the foundation of the Forth Bridge, strong masonry was built from the rock below the water up to the top. Then huge pillars of hollow steel were put up for the cantilevers, and were fastened down to the masonry with enormous steel bolts. They are 343 feet high, but so strong that neither the weight and vibration of great trains nor the force of storms can break them.

The giant pillars having been made fast, the cantilevers began to grow out from them. Each is really a double cantilever. They stand like brackets back to back. Perfectly balanced, they stood firm while the engineers built out into the air from them, like brackets fixed to the walls, bearing heavy shelves.

CARRYING A TRAIN ACROSS A CHASM

The bridge near the Victoria Falls on the Zambesi River, in South Africa, is the highest bridge in the world. The river here suddenly drops into a vast gorge, which winds and twists for more than fifty miles. The bridge takes the trains across at the most convenient place. It is 400 feet above the water and 600 feet long, and is an important link in the railway that is to connect Egypt with South Africa.

A cable was sent across the chasm by rocket, and work begun from both sides at once. This picture shows us how the building-out on one side began.

So that the men might work safely, a net was stretched across the chasm. We see it here, under the bridge, ready to catch men in case they fall.

Building out from the two sides, the men worked like clockwork. The two parties met in the centre, and we see them joining the last two girders.

After the final touches, the bridge was painted grey. Now, amid the flying spray, it can scarcely be seen, and the scenery has not been spoiled.

INSIDE TWO OF THE GREATEST BRIDGES

This shows the footway of Brooklyn Bridge, the first of the great bridges built to connect Long Island with Manhattan Island (New York City). There are now four of these bridges. All of them are provided with separate roadways for foot passengers, for street cars, elevated trains, and for other vehicles.

We have seen the building of the Forth Bridge from the very foundations. Now we take a glance at the inside as the engineer sees it. There are two sets of rails, so that two trains can pass at the same time. The cross-beams are part of the strengthening structure. The strength of the bridge is greater than the force of any storm or weight could break. Men are always painting this bridge to prevent rust.

FAMOUS BRIDGES HANGING IN THE AIR

Brooklyn Bridge is one of the biggest suspension bridges in the world. It crosses the East River, to connect Brooklyn with New York. The length of the bridge is over a mile, and its distance across the water is 1600 feet. Cables pass over the towers, and from these other cables hang down to support the roadway.

The suspension bridge over the Avon at Clifton is the most famous of its sort in England. Part of the chains used once helped to hold up Hungerford Bridge, London, before that bridge was pulled down to make room for Charing Cross Bridge. Although the roadway of the Clifton Bridge looks level, it is really two feet higher in the middle than at the foot of the two towers. The bridge has a span of 702 feet.

A BRIDGE THAT OPENS IN TWO

The Tower Bridge is the most beautiful in London. It is a girder bridge and a suspension bridge, and is like the old-fashioned drawbridge which castles and fortresses had, only far stronger. First we see it with the drawbridge down, so that horses and wagons and people may pass, while small steamers can go under it.

Small vessels can pass under the Tower Bridge, but when a big vessel comes, powerful machinery in the towers of the bridge is set to work, the roadway opens in the middle, and the two ends are pulled up. When the vessel has passed, the two halves of the road descend to form one road again, and traffic pours over from both sides of the river. The roadway at the top is always in use, and is for foot-passengers.

BRIDGES ACROSS THREE GREAT RIVERS

Courtesy of the Pennsylvania Railroad.

This beautiful bridge is the longest stone bridge in the world. It is built over the Susquehanna River near Rockville, Pa., where the river is very wide. The bridge is wide enough to carry four railway tracks.

A steel girder bridge, built in seven spans, carries trains over the Hawkesbury River in New South Wales, Australia. It took only three years to build, and was opened in 1889. Its length is nearly 1,000 yards, and it is of great importance to the big cities. Without it the railway would be practically useless.

From this picture you may gain an idea of the size of the great cantilever bridge—the greatest in the world—which spans the St. Lawrence a few miles from Quebec. The bridge measures 3,240 feet from end to end. The central span alone is 640 feet long, weighs 5,600 tons, and hangs 163 feet above high water. It is said that more stone was used in the foundations than in all the foundations in Quebec City.

BRIDGES OVER MOUNTAINS AND LAKES

Canada is crossed by the great Canadian Pacific Railway, which, beginning near the shores of the Atlantic Ocean, ends on the other side of the continent, at the Pacific. It passes on its way over deep ravines and swift torrents, and it is only by bridges like this one, which is at Mountain Creek, that the railway is possible. Canada's prosperity depends upon its railways, and the bridges are the chief links.

This unusual looking bridge is one of the great railway bridges across the Elbe at Hamburg. The double arches are designed to give the bridge the strength needed to carry the immense traffic which comes to this great seaport. No ships pass under this bridge, and, therefore, it is built low down over the water.

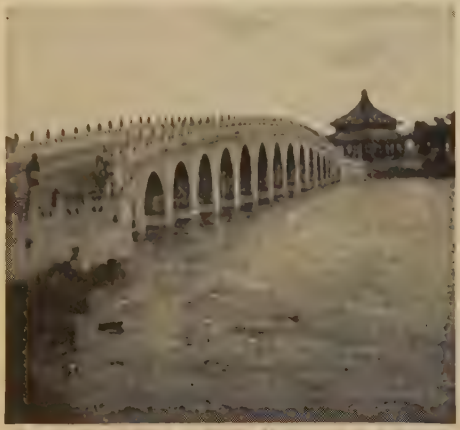
The photographs in these pages are by Messrs. G. W. Wilson & Co., Wilson Bros., Underwood & Underwood, Valentine, Notman, and the Canadian Pacific Railway Co.

A GREAT RAILWAY VIADUCT BUILT OF CONCRETE

This beautiful structure though it reminds us of a great Roman viaduct is very modern and is built of concrete and steel. It is a viaduct built to carry a railway across the valley of the Tunkhannock creek in the Pennsylvania hills. The structure is 2,375 feet long, and at the lowest point of the valley, the bridge is 240 feet high, while the foundations go down sixty feet more to reach the rock. Notice that the bridge has ten arches and the same type of arch is used in the Tyrol bridge on page 36.
Courtesy of the Delaware & Lackawanna Railroad.

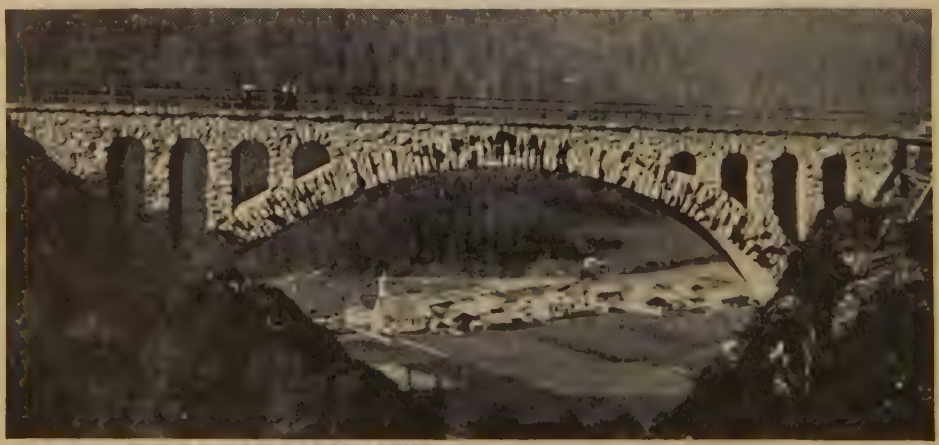
SINGLE SPANS AND MANY SPANS

The bridge across the Rhine at Coblenz, Prussia, shows us the value of the form of arch which John Rennie first used. Although we have only one great span here, the roadway is practically flat, not steep as those over the old single-arch bridges were. This is because the arch is shaped like half an egg.



The marble bridge at Pekin is famous and beautiful, but its sixteen arches impede traffic in the river, and make the roadway steep. We can all see the difference between this and Coblenz Bridge.

New Brunswick has a copy of Clifton's suspension bridge. It crosses the Grand Falls at a giddy height, and looks, in the distance, like a spider's web. Here we see a vehicle passing over it.



The Austrian Tyrol is trying to the bridge-builder. Three chains of the Alps run through it, and terrible gorges and chasms have to be crossed where the railways run, as we see here at Waldi Tora. This bridge is in solid stone and with a single span, and harmonises with the rugged grandeur of the scene. The village is far below in the valley. There the natives live the old life while the new life passes over their heads.

The Marble Bridge, copyright by Underwood & Underwood, N.Y.

OLD-FASHIONED PATHS IN THE AIR

This picture gives us an idea of what bridges were once like. Here is one built on piers made of nothing but logs. On top there is a roadway of timber. This is the bridge at Sringar, the beautiful old capital of Cashmere, Northern India. The houses recall the bridges of old-time London with their shops and dwellings.

This rough-and-ready bridge serves for fishermen to pass to a rock off the coast of Antrim, Ireland. It consists only of strong ropes and staves of wood. In stormy weather it sways.

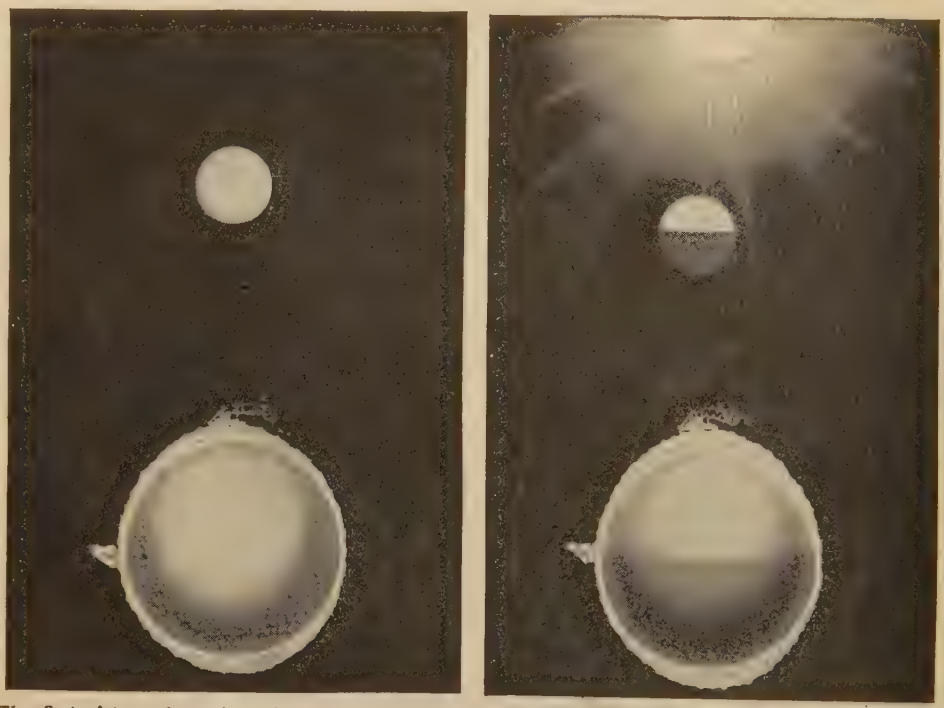
Tight-rope walkers should like this bridge. It is made up of three ropes. Two of the ropes serve as hand rails; the third is the footpath. It crosses a river in India, which has many such suspension bridges

In this type of big bridge the single arch and cantilever are not used. It is the Iwakuni Bridge in Japan, a bridge of wood and stone, in four spans. Only small ships can pass under it, and the roadway is as steep as a switchback ladder, and is furnished with 200 steps. Horses and carts cannot go over it.

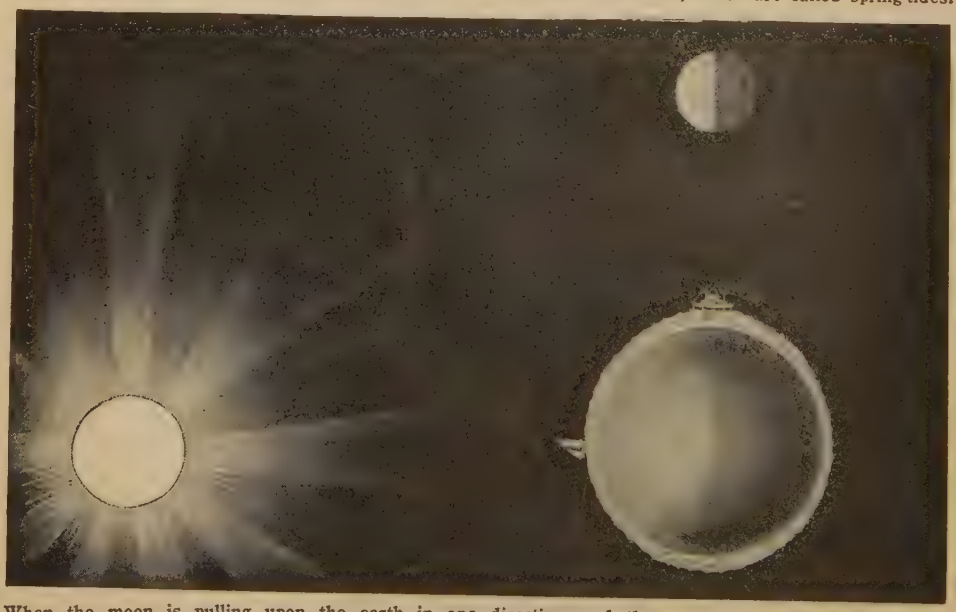
THE NEXT STORY OF FAMILIAR THINGS IS ON PAGE 79.

Two middle pictures, copyright by Underwood & Underwood, N.Y.

THE SUN, THE MOON AND THE TIDES



The first picture shows how the moon attracts the earth's water on the side nearest to it, causing a high tide there; then it draws the earth itself away from the water on the other side, leaving a high tide there. The second picture shows that it is not only the moon that makes the tides. The sun does its part, although, being so much farther away, it is less powerful than the moon. When the sun and the moon are both pulling the same way we have very high tides, which are called spring tides.



When the moon is pulling upon the earth in one direction and the sun is pulling in another, the tides are not so strong as at other times, because the pull of the sun is telling against the pull of the moon. These lesser tides are called neap tides, neap meaning narrow or scanty. Spring tides are so called because the water is then said to spring up or leap. When the tide is high in some parts of the world it must be low in other parts, because the water is drawn away from those other parts.

I WONDER WHY

ALL our lives we are asking questions; all our lives we are saying to ourselves, "I wonder why." Why is it dark at night? Where do I go in my sleep? How do I remember? To all of us come such questions as these, and as long as we live, however wise we grow, such questions will come. The questions will never stop as long as the world lasts, because out of the answer to one question another question grows; and so, all through the world and down all the ages of time, people have been saying to themselves, "I wonder why." All through our book we shall find the answers to our questions, but in this part we shall find questions about many things which we particularly want to know. We learn, first of all, what causes the tides, and why they come in and go out and are so much higher at one time in the year. We will learn why oil will not mix with water, where a flower gets its smell, how a camera takes a picture, why we do not see things upside down, and many other interesting things.

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DOES THE MOON PULL THE SEA?

THE moon does pull the sea, and it is the pulling of the sea by the moon that makes the tides. In any great dock or port or harbor we see how the water rises and falls twice a day, and we know that it is the tides, as we call them, with their increasing ebb and flow, which bring all this water to us and take it away again without ever stopping. The tides never stop because the earth never stops turning, and it is the turning of the earth that somehow makes the tides. Plainly *tides* have something to do with *days*, for they always correspond. Long ages ago, even before men knew that the earth turns, they saw, as they could not help seeing, that the tides have something to do with the moon. Nowadays we can answer the questions about the tides very conpletely.

HOW DOES THE MOON CAUSE THE TIDES?

Let us suppose for a moment that the moon did not go round the earth, but simply moved through space with it. Then the moon would appear to rise and set, as it does now, only it would rise and set at the same time every day. And so, at the same time every day, in any part of the world, there would be tides, as there are now. The only difference between this and what actually happens is that the moon is moving around the earth, while the earth turns upon herself. This makes the moon seem to rise and set, in any place, about half an hour or so later every day; and the tides, we find, always correspond.

The moon is made of matter, and so is the water of the sea. All matter everywhere pulls, and is pulled towards, all other matter everywhere. We call this gravitation. So far as the whole earth is solid, the whole earth, and the whole moon, are affected by this pull; but as part of the earth is ocean, so to speak, and as water is not rigid, it can be, and is, especially affected by gravitation. The water opposite the moon at any time is pulled up towards the moon; and as the earth is turning all the time, this really means that a mighty heaped wave of water travels over all the oceans, day and night, in response to the pull of the moon. If the moon had oceans, there would be tides there too, owing to the earth's pull; and as the earth is very much bigger than the moon, these tides would be enormous. But the moon has no oceans, though possibly it has ocean-beds, long since dried up. All the moon does is simply to pull the water towards it as the earth twists and exposes new parts of water to its action.

DOES THE SUN MAKE TIDES?

The sun also makes tides on the earth, just as the moon does, and for exactly the same reason; but the power of gravitation lessens very quickly as the distance through which it acts increases. Thus, though the sun is

vastly bigger than the moon, it is so far away compared with the moon that its influence on the ocean is comparatively small; but it can be shown.

DO THE SUN AND THE MOON PULL THE EARTH AT THE SAME TIME?

We have just said that the principal consequence of the *real* motion of the moon round the earth is simply that the moon seems to rise anywhere at a different time every day or night, and so the tide changes also every day. But there is another consequence. As the moon goes round the earth once every month, there will always be times when the moon and the sun are on the same side of the earth, and times when they are on opposite sides of the earth; while, in "between times," the lines from the sun to the earth, and from the moon to the earth, will be at right angles, or nearly so, to each other.

Now, when the sun and moon are pulling on the same side of the earth, they help each other; and the tides during a few days will be very high and very low as the water flows and ebbs. At another part of the month, when moon and sun are on opposite sides of the earth, they pull against each other. The moon wins this tug-of-war, but it has to be content with pulling the water towards itself much less than at the other time, because the sun's pull is now opposing, and not helping the moon. At the other times the tides will neither be very marked nor very little marked, but "betwixt and between." Watch the tides anywhere day by day for a month, and you will see all this for yourself.

WHY DOES THE TIDE COME IN AND GO OUT?

We should think of the shore as if it were part of a saucer partly filled with water; then if the water is added to, the "tide" will rise. To raise the level of the water is to cover more of the saucer, and *vice versa*. And so we shall understand how the tide comes in and goes out at very different rates, apparently, in different places. In a dock, where the water is all heaped up and deep, it needs the addition of much water to make any difference that we can notice; the tide seems to rise slowly. But where the shore is very flat, then the added water—due to the pull of the moon, as we know—spreads itself out over a wide space, and we say that the tide comes in quickly. If you pour a tablespoonful of water into a vase with very steep sides, you do not cover much more of the sides of the vase with it; but if you pour the same amount of water on a flat table, of course it covers a lot of the table. There are places where the shore is so nearly flat that the tide comes in much more quickly than a man can run—comes in in a great tidal wave which even a man on horseback may fail to escape, so quickly does it run. On page 478 of this book is a well-known song called "The Sands of Dee," a poem by Charles Kingsley, which tells how a girl was drowned in this way.

WILL THE EARTH EVER LOSE THE MOON, AND WILL TIDES THEN CEASE?

The answer to the first of these questions is no, for there is a limit to the distance that the moon can go from the earth; and astronomers believe that when the moon reaches that distance it will begin to come nearer to the earth again. Indeed, they believe that some day the moon must return to the earth which gave it birth, and *then*, certainly, the tides will greatly diminish, for the sun alone will be left to produce them. The sun-raised tides will remain, but very different tides indeed from those which the sun raised upon the earth ages ago—perhaps 60,000,000 years ago, as has been estimated—when the solid crust of the earth was not formed, and when all the water of the earth was suspended in the atmosphere, as some of it is suspended even now, in the form of water vapour. Those were tides indeed, for there was no dry land then, and the great tidal wave flowed without end over the whole earth as it turned and turned under the steady pull of the sun. Not only so, but the moving liquid of those tides was not mere cool water, but *flowing rock*, like the red-hot lava that flows out of volcanoes sometimes.

WILL THE MOON EVER RACE THE EARTH IN SPACE?

The moon travels more slowly than the earth, but it is calculated that some day the moon will go round the earth at the same rate as the earth twists on itself. If that ever happens, the tides raised by the moon may cease, even though the earth does not lose the

HOW THE SEA MOVES BACKWARDS AND FORWARDS

What a difference high tide and low tide make at the seaside! At low tide we can play upon the beach; at high tide we cannot, because the waves cover it. The tides are caused by the attraction of the moon and sun upon the ocean, but especially of the moon, which is nearer to us than the sun. The moon draws the water like a magnet, and makes it get heaped up more on one side of the earth than on the other. But the earth turns round every twenty-four hours, and so the heaped water, or tide, travels round it, leaving those places on the shores dry which before were covered with the waters. This is why the tides are regular.

There is the sea being pulled by the moon, which draws it as a magnet draws steel, and sends up the water rolling towards the shore. It will dash up against the rocks, and flow up the mouths of rivers and into docks, and cause high tides in them, just as it does upon the beach. Nothing can stop it in its course.

It is wonderful to think, as we watch the tide creeping towards the beach, that boys and girls may be watching the effect of the same tide many miles away in a great country. We can stand on the banks of the Hudson, at Albany, N. Y., and watch the effect of the sea, which is 145 miles away. Here are two pictures of the Thames, in London. The tide has gone down, and the water is low and does not fill the channel.

The tide turns. The sea forces its way up the bed of the Thames and hinders the river from flowing out. The mud banks disappear; the channel fills up. Boats and barges float, and where there was mud before we find at high tide 21 feet of water. The water has risen as high as a two-storey house. Millions of gallons of water have come up from the sea to London to stay for a few hours and then go back again.

moon. The two will move for a time together as if a solid bar of steel ran between them; though, if such a bar of steel were required, one big enough to hold moon and earth together would have to be so big that the moon would not be big enough for the bar to be attached to it. Another way of saying what we have just said is that the day and the month will get to be of the same length—after long ages in which the day gradually becomes longer and the month gradually shorter.

Is it true that the day is becoming longer?

When we study the tides closely — and, indeed, many a big book might be written about them — we learn a most amazing fact about them. It is that, as the earth spins, its movement is made slower by the friction of the tides which the moon principally, and the sun to a slight extent, is always moving over its surface. The tides act as a sort of brake upon the rotation, or spinning, of the earth, so that, year by year and age by age, the earth is now, and has long been, taking a little longer than it used to take to spin round completely once.

In other words, the day — which is the time of one earth-spin — is really getting longer. Many estimates have been made of the extent of this, and all are very doubtful; but it is probable that in the course of a century the day becomes nearly a second longer. You will say that is not much; but a century is but a moment in the life of the world, and even seconds mount up if you have an endless addition of them.

Will the earth go on moving at the same rate for ever?

No; we have just read that the day is getting longer because the tides are slowing down the mighty top we call the earth. If you rest your finger against a spinning top you will slow it down; it will take longer to spin round; and if there were a bright light in one corner of the room, and if there were a living and intelligent creature on the top, he would notice that his "day" became longer. This has nothing to do with the lengthening and shortening of daylight at different times of the year; we are talking about the real day of twenty-four hours — that means one complete spin of the top on which we live.

Are there tides of fire on the sun?

We have said that if the moon had oceans they would show tides. Now, the sun has no oceans of wet water, but it has oceans, or one continuous ocean-covering, of fiery gases; and we know that the sun, like the earth, spins upon itself, and in the same direction as the earth. Thus, the surface of the sun is pulled out of shape as the sun spins by the pull of the earth, and perhaps also of the other planets, especially such a great planet as Jupiter.

When I say "perhaps," I mean only that perhaps there is a pull sufficient for us to notice. There *must* be a pull, for gravitation always acts between all portions of matter everywhere, only it is not always so marked that we can notice the results. These earth-raised tides upon the sun may be tremendous things, even more tremendous than the sun-raised tides upon the molten earth of long ago; but in both cases no harm can come to any living thing, as life cannot exist at all under such conditions.

Does the sun make tides in the air?

When we are thinking of these tides of gas upon the surface of the sun, we must remember that our own atmosphere, which we call the air, is itself made of matter, and is therefore subject to the gravitational pull of both moon and sun. Thus, there must be atmospheric tides as well as ocean tides, though we know very little about them yet; and these gaseous tides, unlike those of the sun, may be of great importance to life, since they affect the great envelope of gas which sustains all the life of the earth. We are only at the beginning of our study of the weather yet; and some day the atmospheric tides may help us to explain many or some of its doings.

Why will oil not mix with water?

When two lots of liquid, added together, mix perfectly, it is because the molecules that make up the one liquid are just as ready to link on with the molecules of the other liquid as with each other. The most perfect case is, of course, when the two liquids are the same, as when water is added to water; and the next most perfect case is where the liquids are very similar,

so far as the linkage of their molecules is concerned, as when water and alcohol are mixed. But when oil and water are added to each other, we have two liquids which are made of very different kinds of molecules. The molecules of water are very small, and those of oil are enormous—made of great numbers of atoms, instead of only three apiece, as water is. And the large molecules of oil find it very much more natural and easy to link with each other than with the molecules of water, and the molecules of water find it very much more natural and easy to link with each other than with the molecules of oil, so that, as a visible result of these invisible causes, the oil and the water keep apart.

WHERE DOES A FLOWER GET ITS SMELL FROM?

The smell of flowers is due to special kinds of essences or oils which the plant makes within itself for its own purposes. Some of these are very like each other, and, indeed, there is perhaps a very general kind of family resemblance between most of them, especially when they are made by plants which belong to the same family or order. Almost all the plants which make these oils seem to go to work on the same general principles, and the type of them is the oil which we usually call turpentine, and which is made by a special kind of plant.

This oil is really a very complicated compound of only two elements—carbon and hydrogen. This class of compounds is often called the *volatile* oils, for volatile simply means *flying*. And this tells us that they very readily escape into the air, and move about in it. Of course, if they did not do that, we should not be able to smell flowers by merely holding our noses near them. We find in these volatile oils some of the useful things that the plant world affords us. As they nearly all consist of carbon and hydrogen, and if they have oxygen in them, too, never have much, they could all be burnt; but they are much too expensive to use for that purpose, since, after all, the sweetest or strongest smelling plant only contains a very tiny quantity of the oil. The real uses of these oils are, first to provide us with the pleasant scents that we know; second, to keep off insects when they are troublesome in their desire to sting or bite us; and, third, to kill all sorts of microbes—for they are one and all poisonous to microbes.

WHAT GOOD DOES SMELL DO FOR FLOWERS?

But we must remember that the plant makes its volatile oil not really for us, but for the needs and purposes of its own life. And so it is, in truth, much more interesting to learn, if we can, *why* the plant should make its oil, than to learn why we are glad to squeeze the poor, dead plant and get the oil out of it.

Well, we first notice that, as a rule, it is the flower that bears the scent; not the root or the stem, or even the leaves, but specially the flowers. We shall see the meaning of this, if we remember what the flower itself exists for. The plant makes flowers because by them it bears the seeds which, when they are made ready, and have fallen upon the earth, will give birth to a new plant. Most commonly, it is the visits of certain insects that prepare the seed for its burial in the earth, where it will grow into a new plant. The insect has visited another flower of the same kind of plant, and brings from that something which it gives to the second plant, so as to prepare the seeds.

Now, it is necessary that the insect should somehow be attracted to the flowers. First, then, the plant makes its flowers beautiful and easily seen, so that the insect may notice them; and, secondly, it very often makes a fragrant scent, so that the insect, which has a very keen sense of smell, may be attracted by that also. On the other hand, there are often microbes about which may attack the precious flower; but microbes are killed by these volatile oils.

WHY DO NOT ALL FLOWERS SMELL SWEET?

It is not insects, but the wind, that does the work of carrying the *pollen*, as it is called, from one flower to another in the case of many plants, and these plants usually have very small and not at all showy flowers, and very little scent, or none; they do not need to attract insects. The plants without smell, or the plants that do not smell nice, are generally those that do not need the insects. Some flowers are very small and much hidden, like the violet; but they make up for this by having a particularly strong and delicious scent to lead insects to them.

HOW DOES A CAMERA TAKE A PICTURE?

The pictures on page 47 really show us quite well how a camera takes a picture. If we understand the eye, we understand a camera. In both there is a dark chamber (camera is simply Italian for chamber), a lens, or lenses, in front, and a sensitive screen, or curtain, or "plate," or "film," behind. All the light allowed into the chamber must come through the lens or lenses, and they throw it — upside down, as the pictures show — on to the screen or plate behind. In the case of the eye, we cannot quite explain how the screen is able to register the light that falls on it, and we are still farther from even guessing how the nerve running to the brain is able to tell the brain what has been happening on the screen.

But in the case of the camera the thing is really quite simple. We merely take a plate of glass, or nowadays often a film of gelatine, and we place upon the plate or film a thin and smooth layer of some chemical compound which light has the power of decomposing — for instance, a salt of silver. So where the light falls the layer of salt is decomposed, and where the light is brightest the decomposition is most complete.

WHAT HAPPENS INSIDE THE CAMERA?

A white thing, like a collar, sends strong white light on to the film or plate and quite destroys the layer of salt it finds there. Then we do something to the film or plate, so that no light can do any more to it, and when we look at it we find dark places corresponding to the brightest and lightest parts of the thing we were photographing, and *vice versa*. The light from the thing we photograph — that is to say, the thing — has printed itself dark, and where there is "nothing" to photograph, white is left. As everything is the opposite, or negative, of what it really should be, we call this plate the *negative*. We then let light shine through the negative on to a sensitive piece of darkish *paper*, and now the salt, where it remains, keeps the light from the paper, and, where it has been destroyed, the light gets through and bleaches the paper. So we get a *positive* picture, in which light and dark correspond to the light and dark of the original. *Photo* means light, and *graph* means writing. A photograph is a thing that has been written by light.

WHY DOES A CAMERA TAKE PICTURES UPSIDE DOWN?

The pictures on page 35 will answer this question for you, said the Wise Man. When a ray of light passes through a piece of glass, like that shown in the picture, curved as a marble is curved, it is bent towards the thickest part of the lens, as the piece of glass is called; and if you look at the picture at the bottom of the page you will see at once that, in such a case, when the rays have come through the lens, those which were at the top will now be at the bottom, and those which were at the bottom will be at the top. In the same way those which struck the lens on the right will come out at the left, and those which struck the lens on the left will come out on the right.

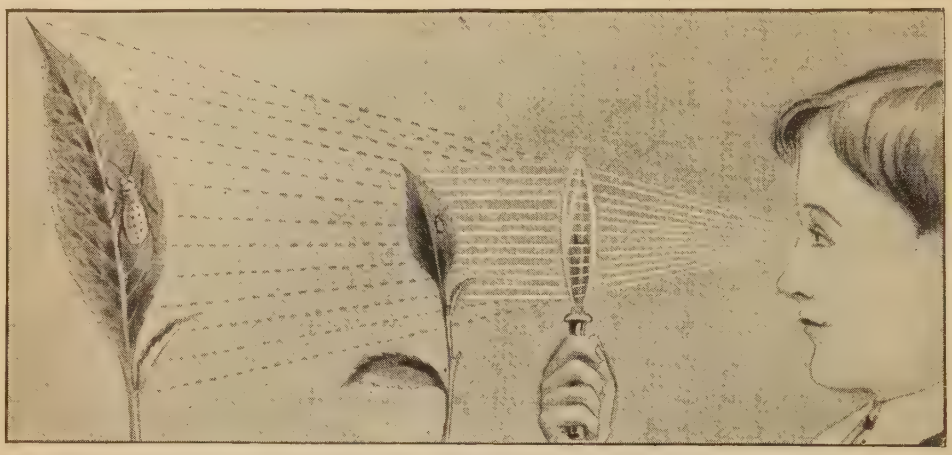
Now, the pictures on page 47 show us that our own eyes are just like a camera in this respect. Like the camera, they have a lens in front and a sensitive plate behind, only it is a plate which never needs changing. The rays of light have to follow the same rule in the camera of the eye as they do anywhere else, and so the images of everything that we see are thrown upon the screen, or curtain, or retina, of the eye, as it is called, with the top at the bottom and the bottom at the top, and with the right to the left and the left to the right; and yet we do not see things upside down!

WHY DO WE NOT SEE THINGS UPSIDE DOWN?

There are many people who can never understand the answer to this question. It is really a hard question, and many silly answers have been given to it. People have said that we do see things upside down, but that, by custom and experience, we think we see them right side up! In order to support this answer, it has been declared that a person born blind, but having sight given him by an operation when he was grown up, would see things upside down! But the reply to that is that such a person does not see things upside down, but right side up. Only, like a baby, and for the same reason, he cannot judge the distance of things, and at first he stretches out his hand for things that are far away.

The real answer to this question that has puzzled so many people is that the

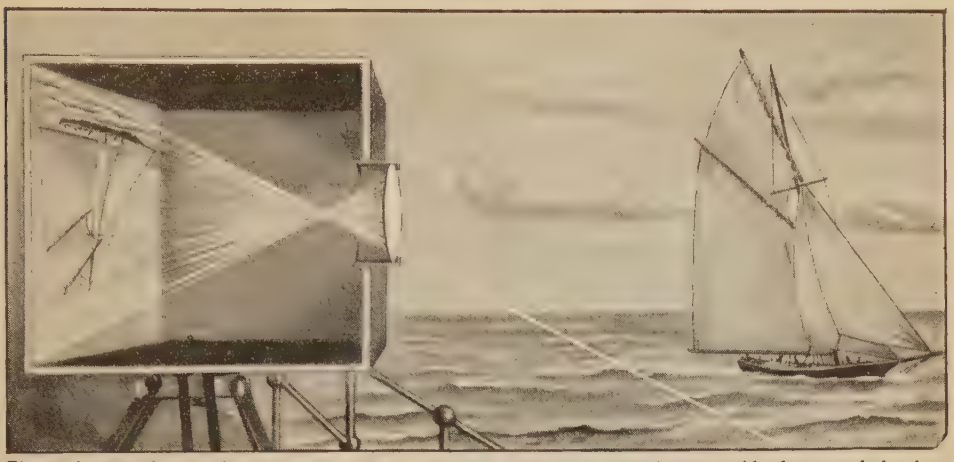
HOW A MAGNIFYING GLASS MAKES THINGS BIGGER



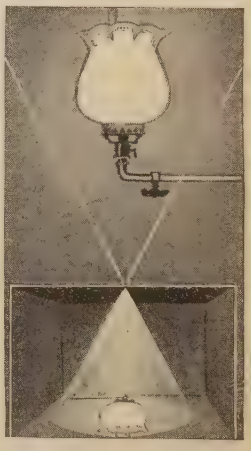
These pictures show us how a magnifying glass makes things appear larger than they really are. What happens when we look at, say, a leaf, is that rays of light are thrown off by the leaf and brought together to our eyes. When we use a magnifying glass the rays of light pass through the glass and bend—as a stick

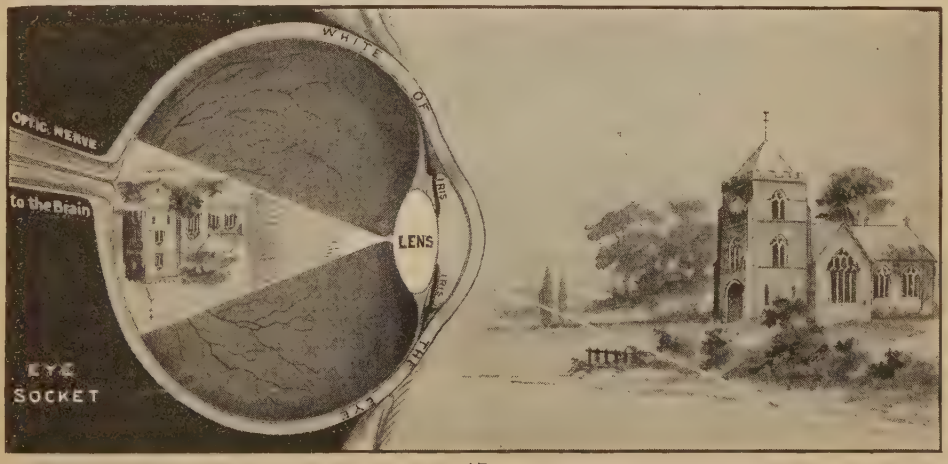
appears to bend if you put it in water, or as the pair of compasses seems to bend in the glass of water shown on this page. When the rays of light reach the eye, the eye imagines that they have come in straight lines, and it appears to the eye that the light comes in lines, as shown by the dots in this picture, What we really see are rays of light. These rays, not being able to go straight through a magnifying glass as if it were a piece of ordinary glass, are bent in passing through the glass, and what happens then is as if the eye, having collected all these rays to a point, throws them out again in straight sloping lines, at the end of which we see the image, looking much bigger than it really is. So that what we see through a magnifying glass is not the actual leaf, but the rays of light thrown off by the leaf, first bent by the glass and then straightened out again so as to appear to cover a much bigger space. A curious thing happens if the rays of light are allowed to continue beyond the eye instead of being focussed by the eye. We can do this with the aid of a microscope, as shown in the bottom picture. In this case we see the leaf upside down. This is because the rays of light meet, and then, as the rays must go straight, the line of light coming from the top of the leaf goes down, while the line coming from the bottom of the leaf goes up. In the top picture the meeting, or focussing, of the lines of light takes place inside the eye, but in the picture below we see the rays focussed through the glass instead of inside the eye, and we see them, therefore, continuing until they are reflected in the looking-glass, where we see the enlarged picture upside down. This helps us to understand what happens inside the eye, as explained on the next page.

HOW THE CAMERA TAKES YOUR PHOTOGRAPH



These pictures show us how a camera takes a picture, why it takes the picture upside down, and also how the eye is like a camera in this way. The boat in this picture gives off rays of light, which strike in all directions. Some of these rays go out towards the camera, and, as light always travels in straight lines, never crooked ones, all the rays that can be seen from the lens of the camera travel straight up or down towards the lens. Inside the lens they continue traveling in the same direction, and at last they meet and cross, so that the lines of light given off by the top of the boat strike the bottom of the photographic plate, and the lines given off by the bottom of the boat strike the top of the plate. The small picture on this page shows a way in which any boy or girl can find out how the lines of light cross so as to make an image upside down. Take a white cardboard box without the lid, and prick in one side a small hole with a pin. Hold the box, say, under a gas-jet, so that the gas will reflect through the hole. The hole will then act as a focus of the rays, which will enter the box through the hole and cross, so that the inside of the box, where they fall, will reflect the gas-jet, which will be upside down. The bottom picture shows us that the eye acts in the same way as the camera, but a very wonderful thing happens in the eye that no man quite understands. When the photographer finds that his picture is upside down, he turns the plate the other way and everything is right. But what wonderful thing is it that turns the picture printed inside the eye the right way up? The rays of light stamp themselves upon the retina of the eye as seen in this picture, and the nerve of the eye carries them to the brain. What happens there nobody knows, but when the brain brings together these rays of light so as to make a clear picture, the picture is the right way up. The picture is printed on the retina of the eye upside down, but our brain puts it right in the millionth part of a second, and this is, perhaps, as great a miracle as anything that ever happened.





question is nonsense, and that is what we cannot understand until we have thought about it for a long time. Seeing is an act of the *mind;* and the mind is not a thing in space, like a chair, or your body. We seem to go on thinking that somewhere in the brain, where seeing is really done, there is a kind of man standing upright and looking at the picture thrown on the screen or retina of the eyes; and, as that is upside down, we wonder why *he* does not see it upside down. But we have no right to think of the mind as if it were a person standing upright. Suppose that the mind really were a person, what right have we to say he is standing upright? Suppose I were to say that he was standing on his head (which would, of course, solve the difficulty, as then he would see the eye-picture right side up), how could that be disproved? That, said the Wise Man, is my own way of trying to explain this; but if I said so I should be talking just as much nonsense as anyone who said that there was a person standing upright in the brain. The being that sees is MIND; how it sees, and what mind is, no one can tell us yet.

WHY DO THINGS LOOK BIGGER THROUGH A MAGNIFYING GLASS?

The laws which explain this are really the same as those which explained the last question. If you take a magnifying glass and hold it far away from your eye, you see a very small picture upside down of what is beyond it. That is what happens in our own eyes, and that is what happens in a camera. But if you take that same magnifying glass and hold it over this page, then, instead of getting a small image upside down, you get a large image of the page right side up.

The fact is that you have put your eye in the way of the rays of light coming through the glass before they have crossed, but as they are meeting each other. Your eye, then, imagines that it sees the letters much larger than they are, because the rays as they come to it look as if they came along the dotted lines in the picture. But you can understand that if you moved your eye far away back from the magnifying glass, so that the rays of light had crossed before they reached it, then everything would be quite different. I think you ought to get a little magnifying glass, and discover for yourself the two kinds of pictures of the same thing, very different from each other, that can be seen through it.

WHY DO WE SEE A BLACK SPOT IN THE SKY AFTER LOOKING AT THE SUN?

We said just now that the retina, or screen, or curtain, or sensitive plate at the back of the eye never needs changing. You can see one picture after another, day after day, and year after year. But it is possible to work this screen too hard; it is a living thing, and it is just because it is alive that it is able to recover itself, and, so to speak, make itself fresh again—if it has time—for every new picture that we see with it. A photographic plate *sees*, as we may say, because certain chemical compounds that are upon it are changed by the light. The retina of the eye *sees* in the same way, but because it is alive it has the power of making afresh from moment to moment the particular kind of stuff that the light acts upon.

But if you stare hard at any light so intense as the sun itself, then, at that spot of the retina where the light falls, all the reserve supply of this sensitive stuff is used up; and now if you turn your eyes somewhere else, that particular spot is useless for the moment; it is blind, it sees nothing. But if it sees nothing, whereas all the retina round it sees light, that gives us the notion that we see a black spot—that is to say, a spot from which no light comes. But in a second or two this wonderful living screen recovers itself, makes a fresh supply of the stuff light acts upon, and the black spot disappears.

HOW DID THE BLACK MEN GET BLACK?

Nobody knows the complete answer to a question like this, because the origin of the different races of mankind is lost in very ancient history, long before we have any definite records; but we know that we find black people living in the hottest parts of the earth, in many places where white men find it impossible to live. So that evidently the black races have developed some power of resisting the climate in these spots, and also the diseases peculiar to those parts of the world; a power of resistance which the white man has not.

As a result of this, it would come about that only those who were black could live and survive there, and in

course of time there would be nobody except the black people in such places, a black race thus being produced by Nature selecting the blackest people as those best fitted to survive there. The blackness is probably the result of the continued exposure to the great heat of the sun in the tropical countries. Other people have thought that black was the original colour of the human race, and that the white races have arisen from them. Whatever is the reason, the colour of the skin evidently results from certain powers of human beings to adapt themselves to the climates in which they live.

WHERE DO FLIES GO IN WINTER?

Most kinds of flies live their lives in spring and summer, then die. Some of them are fortunate enough to find a place where they can hide and obtain warmth to keep alive. They hide in quiet places about the house, in outbuildings, in the fields and stables, where we should never dream of looking for them. They do not feed. They simply lie dormant, sleeping as a squirrel in his nest, or a bear in his den, or a tortoise in his shell, sleeps the cold days away. But an unexpected warm day in winter comes. The fly feels the extra warmth. It wakes him, makes him hungry and sends him forth to seek food. The warm day passes, and he may get back to safe hiding; but most likely he will not. Probably the cold will return and kill him. Very few flies manage to get through the winter. If they are not worn out and ready to die at the end of the summer, many of them are killed by a fungus which, floating in the air, settles on their bodies, drives roots into their insides, and destroys them. Those we see dead on the window-pane, swollen, with a little halo on the glass about them, have been killed in this way.

DO FLIES LAY EGGS?

As nearly all the flies die this year, leaving few to struggle through the winter, it seems strange, of course, that next year we shall have as many flies as ever. In some cases the female fly lays an egg that changes into a pupa, and is kept in that form during the winter, until the warm weather of spring brings out the young fly. The eggs turn at first into maggots, and from maggots into pupæ, which are something like a chrysalis. In the chrysalis the body of the new fly forms. Millions and millions of flies lay eggs in the autumn. If all these eggs hatched at once, nearly all the flies would die during the winter. Now, the first touch of cold causes the living insect in the chrysalis to stop growing, to become dormant like the bear asleep in winter. A fruit-bud on a tree, when a frost comes, goes to sleep and does not open until warm weather has set it growing again. So it is with the chrysalis of the fly. These pupæ or chrysalides, as we may call them, lie in the ground, or in the heart of wheat or corn which has been cut and stacked for the winter, and so are safe from the cold. The maggots from some flies' eggs can bore and tunnel like worms, and make their way to safety, so that they can, in their chrysalis form, lie safe and snug all winter.

WHERE DO NEXT YEAR'S FLIES COME FROM?

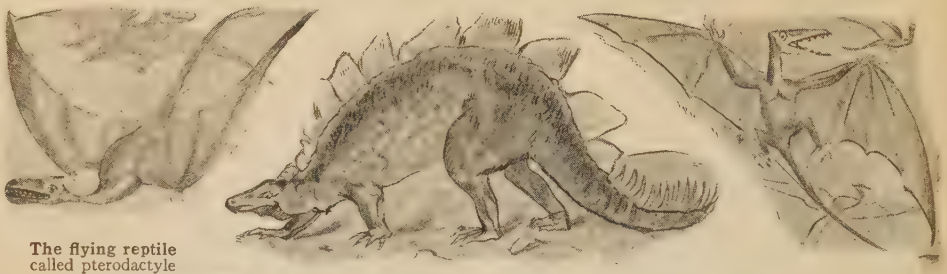
No matter how long the winter lasts, the chrysalis of the fly is safe. When the warm, spring weather comes, the fly inside the chrysalis goes on growing again. At the right moment it bursts open its brown, horny case, and comes out like a chicken from its shell. All that it has to do is to dry its wings; then it can fly away full grown.

Flies reach their full size before coming out of their shell-like covering. When you see small flies and big flies together, you must not think that the little ones are young and the big ones old. They are different sorts of flies, but full grown. They reach full size before they are released from the cradle in which they have passed the winter. It is because most of the old ones are dead, and the young ones still in their eggs, that we seldom see flies in winter.

The common house-fly, when it wakes in the spring lays over a hundred eggs, which hatch in a day or two as maggots. These grow rapidly, become pupæ, and within two weeks from the egg are full-grown flies, ready to lay eggs themselves. You can see how many billion flies there would be if none were destroyed and all the eggs hatched and grew into flies. The house-fly usually lays its eggs in filth, and if we keep our premises clean, we shall have fewer flies.

THE NEXT QUESTIONS ARE ON PAGE 97.

ANIMALS THAT LIVED BEFORE MAN



The flying reptile
called pterodactyle

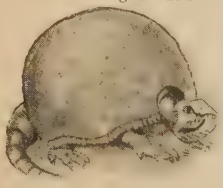
The giant lizard with two brains
called stegosaurus

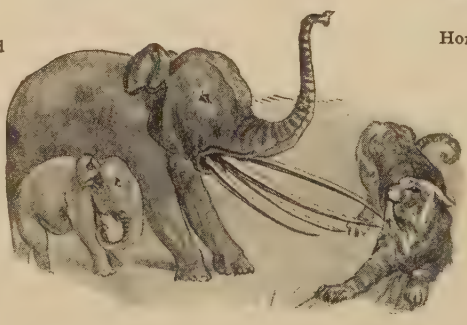
The flying reptile
called pterodactyle

First known air-breathing animal
called archægosaurus

Lizard with feet like a bird
called iguanodon

Horned animal like an antelope
called sivatherium

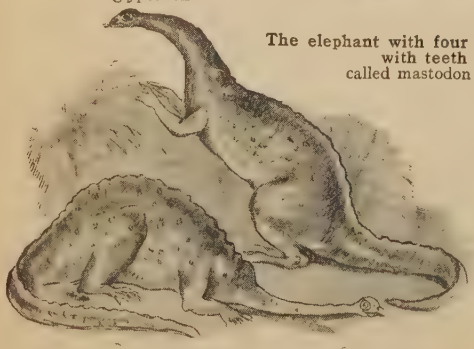




The armadillo, like a giant tortoise
called glyptodon

The great monster with six horns
called dinoceras

The elephant with four tusks fighting the tiger with teeth like swords
called mastodon and machairodus



The great lizard with feet as big as a table
called brontosaurus

The giant elephant that the first men fought
called mammoth

The fish-lizard of the sea
called ichthyosaurus

The fish-lizard with a neck like a snake
called plesiosaurus

THE STORY OF THE ANIMALS

NATURE, a wise man said, is the mother of us all. By Nature we really mean the whole of life—everything that is not made by man. But many natural things, such as the sun and moon and the earth itself, come into other parts of our book, and here we shall read of the two most important things in Nature—Animal Life and Plant Life. There were plants on the earth before the animals came, but it is better to begin with animals, and our book of Nature tells us first the story of the animals, and then the story of flowers and trees. We shall not tell our story as grown-up people do, with big words and strange names; but we shall learn all that we need know about animals and flowers, as told by many learned men according to a theory called evolution, which endeavours to explain how they have descended from strange creatures that lived on earth ages ago.

NATURE'S WONDERFUL FAMILY

By ERNEST A. BRYANT

WHEN we are kept awake at night by the noise which cats in the garden make, perhaps we wish that there were no such things as cats. Let us suppose that all the cats were sent out of this country. We know that our houses would soon be swarming with rats and mice. But something far more strange than that would happen. Soon, nearly all those beautiful wild flowers called heartsease would fade away and die. We should have scarcely a heartsease left. That would be because the cats were gone.

What does the cat do to make the heartsease grow? Nothing at all. It never touches a heartsease if it can help it!

Well, why would the heartsease die if the cats were to go away? Because, if the cats went away, they could not catch the field-mice. Soon there would be so many field-mice that they would eat up all the nests of the bumble bees in the fields. Now, the bumble bees are the little friends which make the heartsease grow. The heartsease has a sweet juice which the bumble bees love. The bumble bees fly into the heartsease to drink this juice, and in doing so they carry in with them from other plants a dust, called pollen, which the heartsease needs to make its seeds. If it does not get that dust the heartsease must die. Therefore, if our gardens are to have this pretty flower, we must have cats to keep the field-mice from eating all the nests of the bumble bees. The cats do not kill all the field-mice. That would not do. They prevent the mice from becoming too many. Then, though a few mice do eat nests of the bumble bee, there are still enough bees left to bring the yellow dust to the heartsease.

That is a little thing which clever men were a long time in learning. We ought always to remember it, because it shows how Nature has to plan so that the world may go on in the best way for us. When we think of the world, we think of a great place where men and women and children live. But the world was not made simply to be a home for men and women and children. If there were no living creatures but ourselves, there would be a great many empty places in the world. There would be a great deal of work left undone. There are places in the world where we cannot live.

But Nature does not like empty spaces. She must have living creatures everywhere, in earth and sky and sea. And she has life everywhere.

Our eyes are not strong enough to see all the tiny things which live. If our eyes were as strong as the strongest magnifying glasses, we should see that the air we breathe

is full of very tiny creatures. We should see that the soil in the garden swarms with little insects. We should see that the little drops of water which we drink have in them more living creatures than we can count. We know that there is life in the air as there is life in the sea. We can see the jellyfish floating on the top of the waves. We know that there are big fish and little fish beneath the surface. We know that there are monsters in the sea like whales and sharks, we know that deep down in the sea, deeper than the deepest coalpit in the world, there are creatures such as nobody has ever seen.

So there is life everywhere, all kinds of life, as is explained in the BOOK OF OUR OWN LIFE on page 67. Besides men and women and children, Nature has many workmen, great and small, to carry on the work of the world. Some are big, like elephants; some are so small that we cannot see them. Some fly in the air, some swim in the sea, some creep in the earth. Some live among us as our friends; some live wild in woods and mountains.

THE WAY WE SHALL READ ABOUT THE GREAT ANIMAL WORLD

We shall read of their wonderful ways. We shall see how all these animals, reptiles, birds, fishes, insects, belong to one great family: and how, though they seem so different, they are all the same in some ways. We shall see how men have tamed wild beasts, and how all this great kingdom of animal life is subject to man, the lord of all the animals.

We shall take the big animals and the reptiles first, then the birds, then the insects, and after that the fishes which live in the water, the monsters that look like fish but really are animals, the creatures that live in shells, and the creatures which, although they are really living animals, look like plants in the sea.

There have not always been the same sort of animals on the earth as now. Once upon a time, when there were no men and women and children on the earth, the only living creatures were strange and monstrous animals such as we see in our pictures. These huge creatures, bigger than any animals now alive, were the masters of the earth before man came. Some were so big that they could eat off the top branches of tall trees; some of the animals could fly and swim. The animals we know have come from these; through thousands and thousands of years the monsters were changing and passing away until in their places we have the animals of our own time. Deep down in the rocks we find remains of the monsters still; sometimes when men dig deep down they come upon the whole body of an animal which must have died and been covered up when the rocks were being formed.

THE WONDERFUL WAY IN WHICH LIVING THINGS HAVE CHANGED

It has taken millions and millions of years to make the birds and animals the beautiful creatures that they now are. We read in another part of our book the story of how forests became changed into coal, and we have now to learn that living things have been changed just as strangely as the forests.

The story of the animals and birds makes us wonder if Nature tried all sorts of patterns before she made up her mind what sort of creatures should live in the seas and on the land. Once *all* creatures lived in the seas and rivers. Some lived in shells. Others were soft things like jelly, and had no backbones. These had all the sea to themselves for a very long time. But during this time they were growing into separate families, unlike those which had gone before. Proper fish began to swim about, and there were great sea-scorpions, as big as a tall man, and fishes with skins made like armor.

THE REPTILES, THE FLYING DRAGONS, THE BIRDS, AND MAN

After these there grew up great creatures which could live in the water or out of the water, as the hippopotamus can to-day. Then came enormous reptiles. We have nothing living now like the reptiles which, by slow degrees, came into existence millions of years ago. Some of them had bodies as large as elephants, with heads like lizards, and huge teeth. Some could fly, and some could swim as well as they could walk. From some of the flying monsters came the birds, and still later came animals which, instead of scales and bony spines and great plates of bone, had

hair to cover them. Little by little the animals and birds changed, until they became the kind of creatures that are now living; and then, last of all, when the earth was prepared for him, man appeared.

NATURE HAS BEEN PACKING HER BOX FOR MILLIONS OF YEARS

No man is clever enough to say how much time passed away while all this was happening, but we know that at one time certain kinds of creatures lived on the earth or in the waters, and that after these came creatures of a different kind. There are no books to tell us these things, because there were no men alive to write books, but we find the bodies of these creatures deep down in the rocks to-day. When you unpack a box you begin at the top, and you know that the things on the top were put last into the box, that those lower down were there before the top ones, and that the things at the bottom were put in first of all. Well, Nature has been packing away things in her cellars for millions and millions of years. Her box is the solid rock. It was not always solid rock. It was mud and water. The water dried up, and as thousands of years passed away the mud grew harder and harder, so that it is now rock, almost as hard as iron.

How do we find the old-time animals in these rocks? They were born, and lived and died, and were covered over. Floods carried them away to the seas and lakes, where mud came swirling down with the water from the rivers. The bodies sank and were covered with layer after layer of mud. As time passed away, Nature dried up the seas and lakes, and, by pressure from within the earth, forced up the bed of the seas and lakes and rivers and made it dry land. The fishes and birds and animals which had died and been buried in the mud were sealed up in this mass, and as the mud hardened into rock these creatures became part of the stone.

HOW WE FIND THE ANIMALS THAT LIVED LONG AGO

When we dig deep down to-day we find animals, birds, and fishes, and even insects, many of them perfectly shaped, in the rock, where they have lain for millions of years. The mud which settled about them was so soft that it did not crush them out of shape. It preserved their shape, as it preserved the shape of the beautiful ferns printed in the coal. Some of the big things were just as carefully protected by the mud, without being turned to stone. Great animals like the mammoth, which was a sort of huge elephant, covered with long hair, died thousands of years ago through sinking into deep mud in Siberia, and became frozen hard in that mud; and some of these have been found lately with flesh, and skin, and hair all preserved.

Of course, not all the creatures which were once alive have been preserved in this way. Many were destroyed in various ways after their death, but there still remains enough to show us what creatures of long ago were like, and to tell from what families those now on the earth first came. It seems very hard to believe that the birds, with their lovely plumage and their sweet song, came from ugly reptiles. But once many reptiles could fly.

WHAT THE FIRST OF ALL BIRDS LOOKED LIKE

The oldest bird known is called the archæopteryx. That is a Greek word, which really means "ancient wing." It was an extraordinary bird. It had a long tail, not all feathers as a bird's tail is now, but like a lizard's tail, long and thick, with bones and flesh, and with feathers growing from it. It had two legs, with which it could walk or perch in the trees, but it had two other limbs like hands, which it probably used to climb about the trees instead of flying from bough to bough, as birds now do. It had a curious eye fitted with a sort of armor shield as the reptiles have, and its beak was armed with great strong teeth.

Of course, there is no such bird as this now, and it is not surprising that such a bird should pass away. Even in these days two or three strange birds have died out. The dodo was quite common in the island of Mauritius 300 years ago, but there is not one alive to-day, in all the world, although we may see the skeleton of one at the great museum in London. It could not fly because its wings were so small, and the dodo family was soon all killed. In New Zealand there used to be vast numbers of birds called moas, which were twice as high as the biggest man—

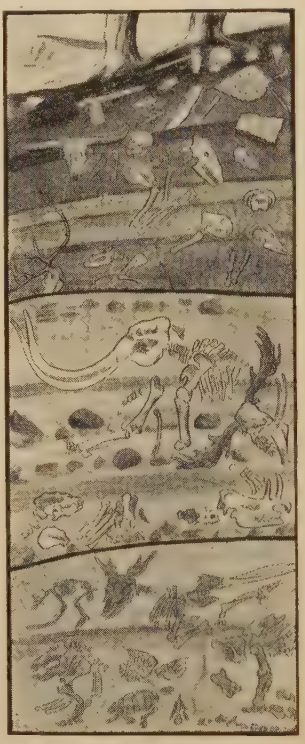
as much as 14 feet high. There still lives a bird called the apteryx, or kiwi [see plate facing this page], which, like the moa and the dodo, and the ostrich and the penguin, cannot fly; but, though it is a fair-sized bird, it is tiny compared with the moa. The great auk, which used to come in thousands to the shores of Newfoundland, is another bird which has died out within the last hundred years. There is not one in the world to-day, but there are a few of its egg-shells, and they are so rare that men pay hundreds of dollars for them.

Men have killed many birds and animals, but in making the world what it now is Nature has killed far more. Whole races of animals have been destroyed by earthquakes and floods, by the sinking of land into sea, and by snow and frost and ice descending upon lands where before all was sunshine and rich vegetation. Then, again, great families of animals have gradually died out, and given place to others better able to fight the battle of life.

Think of the horse, that swift and beautiful creature! Once upon a time, long before man appeared on the earth, the horse was a miserable little thing with five toes on its front feet and three behind, and only as big as a fox. The horse has, through a long number of years, become larger and swifter and more beautiful, and its soft, spreading toes have become hard hoofs.

Think, again, of the humming bird, that tiny beauty, not much bigger than a good-sized bee, and remember that it may have come from a monster called the iguanodon, which had a great head like a lizard, a yard in length. It had a great tail and enormous hind legs, with shorter ones in front; and when it reared itself upon its hind legs the height of its head from the ground was 14 feet. In many ways it was like a bird. Its front legs, it is supposed, had first been used as paddles to help it to swim. As time passed away these became changed into wings, with which it learned to fly. It lived on herbs.

There were others rather like it which ate flesh. One of these was a fearful creature called the megalosaurus, which fed upon the flesh of the great animals that lived on herbs. Another was called the brontosaurus, and a third was called the ceteosaurus. These monsters had bodies as big as the biggest elephants. Their legs were shaped like those of the iguanodon, except that the front legs were longer. The length of these creatures was as much as 80 feet; and their backs, when they were full grown, were quite 14 feet from the ground. All these creatures belonged to a family called the dinosaurs, which means terrible lizards.

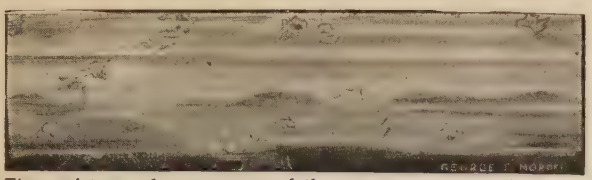


BURIED ANIMALS

We know that huge monsters once lived, because when we dig deep down we find their bodies buried in the earth, where they have lain for millions of years.

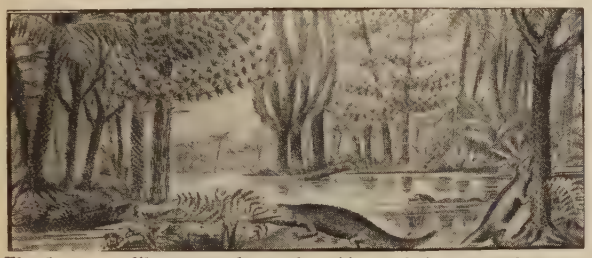
The sea, as we have seen, had wonderful creatures in those far-off days. The waters teemed with what we now call the great fish-lizards. One of these was the ichthyosaurus, which was 40 feet long. It had a wonderfully formed eye, which it could adjust so as to see things quite near or those far away. The remains of this creature are common in England, and scientists have been able to learn that though its home was chiefly in the water, it used to crawl on to the land to bask in the sun, as turtles and seals still do. The ichthyosaurus has died out, but the shark lives as a relic of those bygone times. The whale is a much younger creature.

The sloths, small animals to-day, which cling to the branches of trees and live upside down, are descended from enormous creatures which, instead of having to climb the trees to eat the tender shoots, were powerful enough to pull the tree down to their mouths!



These pictures show us some of the strange creatures that have passed away, and help us to understand the story of animal life from the beginning. Once all creatures lived in the sea, and some of them were only soft things like jelly, with no bones.

These creatures had the sea to themselves for a very long time, and slowly they grew into separate families. Proper fishes began to swim about, and some of them lived in shells. Then on the land great forests grew, and a new kind of animals came.



The first crocodile appeared now, but this age is important because great trees grew, drinking in the sunshine for thousands of years, and then fell, to be buried in the earth, and to lie there millions of years until they turned to coal. That is how coal began.

In the sea fish-lizards grew, four times as long as a man, some with necks like snakes; also great sea-serpents, fish with skins almost like iron, and huge animals that could live either on land or sea.

Some of these creatures could fly and swim, and some could eat off tree-tops. The first birds came, and flying dragons. Millions of years later these animals were replaced by the birds we know.

HOW THE ANIMALS CAME INTO THE WORLD

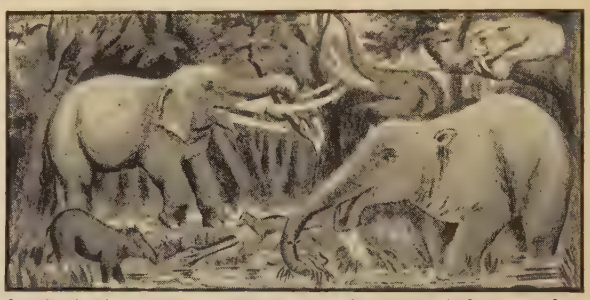
The bodies of these monsters were as big as elephants, and their front legs had enormous power. Similar to the great sloth was an animal called the mylodon, the remains of which have been found in a huge cave in Patagonia, along with the bones of other wild animals. It must have been buried there a very great time ago, for among the bones were those of animals now extinct. In this cave there were also the bones of dogs and men, with bones made sharp by man to use, perhaps, as dinner-forks; and here also was found a quantity of cut grass, which makes us believe that once upon a time savages kept the mylodon alive in the cave and fed it with grass, just as we feed cows and horses to-day.

Nearly all these extinct monsters made their home at one time in the United States. In those days the whole interior of the continent was covered with water, in which swam huge fishes and enormous reptiles, as well as smaller sorts. On the shores roamed tigers with tusks, lions bigger than any now to be found, great bears which lived in caves, rhinoceroses covered with wool, and herds of hippopotamuses. Scattered about the United States and Europe were gazelles, great wild cattle and little wild horses, beavers, raccoons, leopards, lynxes, and cats, such as are now only known as Egyptian cats. There were crocodiles and alligators in enormous numbers in the rivers, and wild hunting dogs and wolves in the woods and forests. We find remains of such things as these in quarries and coalpits and in deep cuttings when railways are laid or where wells are sunk. Animals which now live only in the coldest parts of the earth once lived in this country, and animals which can live only in hot

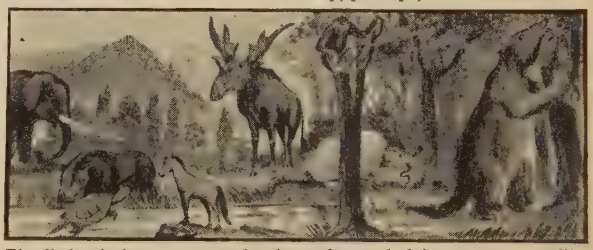
climates once lived here. From this we see how great have been the changes in the climates of this country in bygone ages, and this helps us to understand one way in which animals from time to time have come to their end.

These great animals, once upon a time, had the world to themselves. They were the masters of the earth. They disappeared in the ways we have seen, and in many other ways. Many of them were destroyed by the Great Ice Age, of which we read in the STORY OF THE EARTH, beginning on page 4, when the climate of a great part of the world was suddenly changed, and nearly all living creatures perished from cold.

All these things about the early world we learn from Nature's own storehouses, the rocks and bogs or frozen wastes in which the strange monsters of land and sea fell and died. The great fish-lizards are no more, the monstrous flying reptiles have gone. The gigantic birds are represented only by the ostrich and the emu. But there are still links with the puzzles of those old days. There is still an animal that flies—the bat; and there is still an animal which lays eggs like a bird, and has a beak like a duck. It is called the platypus, and it lives in Australia, where that strange animal the kangaroo, looking like some of the old-world freaks, is also to be found. The great sloth has come down to very small size, though some people believe that there are still monstrous ones alive in Patagonia. The bats, with their wings and claws and mouse-like bodies, remind us of the curious things of old time, and the lizards and the armadilloes tell us of a time when their ancestors were among the marvels of the world.



On the land great monsters were growing up, and the mastodon, like a giant elephant with four tusks, fought the tiger with teeth like swords. There were bats in those days, and a strange little animal walked the earth which we may, perhaps, call the first horse.



The little sloths we see to-day have descended from creatures like that clasping a tree on the right. The giant sloth lived when the hippopotamus and elephant began, when there were horses with many toes, and animals like tortoises bigger than a man.

Slowly the world grew into the kind of place it is now, and the animals became more like those we know. Bears lived in caves, and the wooly rhinoceros and the savage hyena roamed the earth with the mammoth, like a giant elephant with long hair.

At last came man, the lord of all the animals. The earliest traces of man on earth show that he killed animals with stone weapons, and made fires in the caves in which he often lived. It has taken thousands of years for him to learn how to build houses, print books, how to work metals, and do the thousands of things that he does to-day.

SOME OF THE GREAT MONSTERS OF THE PAST

What is the use of all these animals? That is what we often ask ourselves. All things really have their uses. The humble animals and birds and insects are able to teach human beings many lessons. A great man named Brunel, of whom we shall read in another part of our book, wanted to make a tunnel under the Thames. It was quite a new thing which he had to do. And how do you think he got the idea for the work? He watched a little worm burrowing its way into wood, building round itself a case of slime which became hard and firm, and making a tunnel that could not fall in. And Brunel made his tunnel under the river just as the worm made its tunnel through the hard woodwork.

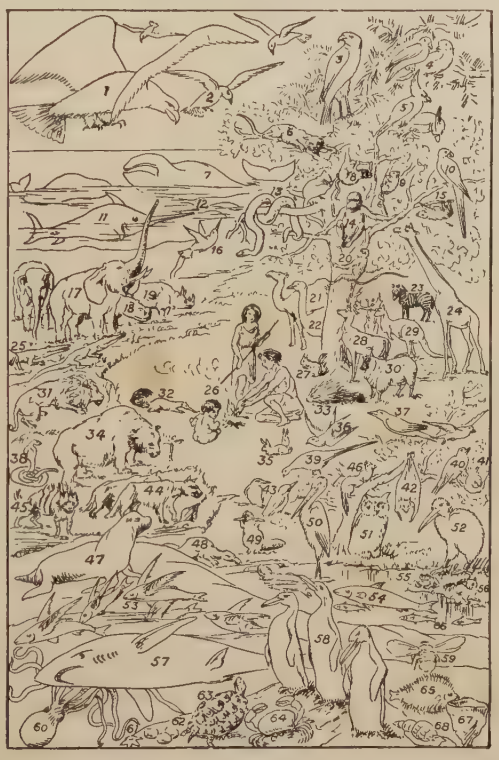
There is nothing more ugly at the Zoo than the alligators and crocodiles. They are cruel creatures, and have to be killed when we catch them, because, when they can, they eat men. Yet we cannot afford to lose them, for they eat things which destroy the crops, and dead bodies of animals drowned in the rivers. If the alligators did not eat them, these bodies would poison the rivers. The great hippopotamus, also, eats the things which grow in the rivers. If he did not, the rivers would become choked with weeds, and boats would be unable to pass up and down.

So there is work for us all. Man has his work; so has the elephant in the forest, the hippopotamus in the river, and the tiniest insect that hums in the air. They do the work they are created for—to help to keep the world healthy.

THE NEXT ANIMAL STORY IS ON PAGE 151.

THE NAMES OF THE WONDERFUL THINGS THAT LIVE ON THE EARTH

1 Eagle
2 Sea-gulls
3 Sparrow Hawk
4 Doves
5 Cockatoos
6 Tree Leopards
7 Whales
8 Lemur
9 Opossum
10 Macaw
11 Sword-fish
12 Dolphins
13 Python
14 Orang-outang
15 Sloth
16 Humming Bird
17 Elephants
18 Hippopotamus
19 Rhinoceros
20 Monkey
21 Camel
22 Ostrich
23 Zebra
24 Giraffe
25 Crocodiles
26 Man
27 Squirrel
28 Deer
29 Kangaroos
30 Sheep
31 Lion
32 Ant-eater
33 Porcupine
34 Bear



35 Rabbits
36 Swallows
37 Raven
38 Cobra
39 Pheasant
40 Thrush
41 Blue-tit
42 Bat
43 Kingfishers
44 Wolves
45 Hyena
46 Pine Martin
47 Sea Lion
48 Platypus
49 Beavers
50 Stork
51 Owl
52 Kiwi-kiwi
53 Flying-fishes
54 Salmon
55 Toad
56 Rat
57 Shark
58 Penguins
59 Bee
60 Cuttle-fish
61 Star-fish
62 Oysters
63 Tortoise
64 Crab
65 Globe-fish
66 Carp
67 Cup Sponge
68 Whelk

This little diagram shows 68 kinds of living things, from the jelly-fish in the sea to elephants and men. We do not see them in the proper size, but the picture shows us what a wonderful world of living things this is. No man has ever been able to count them all. By looking at the numbers in this picture, and then at the side numbers, you will be able to find out the names of the things represented.

A FAMILIAR PICTURE OF THE LANDING OF COLUMBUS

Many artists have attempted to represent the Landing of Columbus on the little island which he called San Salvador, and this picture is familiar to many. It has been used on paper money and on a stamp. It was painted by an American artist, John Vanderlyn, by order of Congress and hangs in the Capitol at Washington. It represents Columbus at the moment of landing, holding aloft the flag of Queen Isabella, while the natives lurk in the background. Though Columbus is one of the most famous men who ever lived, there is no picture of him which we can be entirely sure was made in his lifetime. The different pictures you see were made from descriptions of his appearance or else the artist shows him as he thinks he might have looked.

THE STORY OF GREAT LIVES

HAVE you ever thought, when looking through the window, that once upon a time there was not a pane of glass in the world? Then a man dug things out of the earth, mixed them, and made something hard, smooth, and clear, so that he could see through it. We call it glass. Who was he? We do not know. But let us think of the great debt we owe him as we stand at the window and look out. And all through our lives let us remember that we owe more than we can ever pay to those who lived before us—to those who wrote books and painted pictures, who discovered the power of steam and made railways, who discovered gas and lighted our houses, who made our roads, who gave us tools to work with; to the doctors who found out the secret of health, to the travelers who found new lands, to those who laid down their lives that we might live and know more and more. We shall read here of some of the greatest of these.

MEN WHO MADE THE WORLD KNOWN

By MANY WRITERS

ALTHOUGH millions of people live in America, nobody in this country is so stupid as to think that these are all the people there are, or that ours is the only country in the world.

We know that by crossing the sea to the east, we reach first the British Isles, and then the continent of Europe, and going forward, first over the land, then over the sea, we may get to Egypt and China and India, and the great lands of the East. Far down to the south, a very long distance away, we come to Australia and New Zealand, with all their people. If we turn to the north, there is Canada, with its millions; down to the South are the people of the South American Republics, and away to the west lies the empire of Japan, where we meet the people of the east again.

It does not seem a clever thing to know all this now, but once upon a time people in Britain thought that there was no other land but theirs, and no other people but themselves. Other people in different parts of the world used to think the same thing about their countries and themselves. They did not travel from country to country as we do now, so they could not get to know of far-off places and different peoples. When they did begin to learn that the world had many different countries, and many different peoples, they were as surprized as we should be if we suddenly discovered the air above to be full of islands and peoples.

People living where the weather is always warm never dreamed that there were such things as snow and ice. Those who lived where the weather is always cold did not imagine that there were parts of the world where it is always summer, where oranges and grapes grow wild in the sunshine, where birds of paradise fly like living rainbows amidst the trees, and fireflys dance like winged rubies in the glowing air.

The story is told in the STORY OF THE EARTH, on page 1, of how people used to think that the earth was flat. The people of those early times did not find it easy to make their way about the world, and to discover other countries and people. Still, little by little, they did learn their way about. There were people living all round the Mediterranean Ocean, and they began to spread about, and to find that the world was larger than they thought. There were wonderful people living in the north of Palestine called the Phœnicians. Their country ran along by the sea for a distance as great as that between New York and Boston, and they built tiny ships and began to explore this great sea. They made friends with King David and King

Solomon; they went to Greece and Spain; they even went to England. They found the way over land to India and China and Persia, and parts of Africa. Well, that had all been forgotten, and, hundreds of years later, Rome, so proud to think herself mistress of all the world, did not know that there was such a place as China! And China had never heard of Rome!

One day somebody brought news to the Court of China saying that far away there was another part of the world, with many rich people in it. The name of the place was not known, but China made up her mind to have the place, no matter what it might be called. A great Chinese general was sent with an army through the centre of the continent of Asia to conquer this unknown land; but he was taken ill before he could get far.

Centuries passed away, and Rome was conquered by barbarians, and then nearly all that had been learned was lost again. Stupid men, who thought nothing about learning, destroyed all the writings that they could, and so the world was divided off again much as it had been before, the people in one country knowing little or nothing about those in other countries.

Think what the world lost by this. If all the books in the world to-day were destroyed, and no more were printed for hundreds of years, people would not be able to read, and some day they would have to begin again to learn all that we know now. So, as that sort of thing *did* happen in the old days, and people went for hundreds of years without learning again what had been lost, we need not be surprized that Caesar never heard of China, or that Shakespeare never knew that there was such a place as Australia.

We shall see in our stories of discoverers and explorers how the great heroes of old times found their way about the world, through strange, savage lands, and upon seas over which they had nothing to guide them. To enjoy the stories it will be better if we can have a map or globe of the world before us, because it is then easier to understand.

THE BOY WHO WALKED TO CHINA

MARCO POLO AND HIS WONDERFUL ADVENTURES

IT is a wonderful thing, but it was, to a great extent, the doings of a boy which set men exploring the great seas to find their way about the world. As we have already seen, men from time to time did go about, but as they made a secret of what they saw and did, their knowledge was of no service to the rest of mankind. Marco Polo was only a small boy of fifteen, and not very strong, when he set out on his travels through strange lands, among savage people, to find his way to China, but when he grew up, what he had seen and known was written in a book for all men to read. His tales of strange countries and peoples, and of the riches and splendors of other lands, made other men want to go where he had been. His book told them how he had got there, so they were able to go by the route which he had followed, but it also caused them to make up their minds to go by sea to the countries which he had visited.

Marco Polo did not go alone to China. He went with his father and uncle. He was born in Venice, and only the love of travel made them set out. His father and uncle had already been to China and back, and now they decided that the brave boy Marco should go with them. They had to go over mountains, and across terrible deserts, through hot burning lands, and places where the cold was terrible. Poor Marco was made quite ill by the hardships, but he got better and kept bravely on.

At last they came to China, where a great King, called Kublai Khan, was very pleased to see them. Marco grew up at the Court, and became a great favorite of the King. Marco learned to speak several languages, and was so clever that the king sent him as his ambassador to Cochin China, to India, and to other lands. Each time he came back, Marco was able to tell the King not only the answer to the message with which he had been sent, but all about the countries themselves: how the people lived, what their trades were, and what were the big cities and rivers and mountains wherever he went. The King had never had so clever an ambassador as this before, and he heaped riches on Marco and his father and uncle.

This picture is from an old French book called "The Book of Marvels," and shows the great king, Kublai Khan, seated on a throne on the backs of four elephants, as described by Marco Polo in the account of his travels.

At last the Polos wanted to return to Venice, from which they had been absent for twenty-three years. The King was very sorry to let them go, but at last consented, and they came back. Marco remembered all he had seen and learned, and afterwards he had it all written down. For long, people did not believe his story to be true. They could not think it possible that there were such great lands as China and India, with millions upon millions of people. And the talk of silks and jewels and beautiful foods and scents of which he told seemed just as untrue. But by and by, when men began to know more, they saw that there was some truth in this book. It set men studying and making bold plans for discovery. The great Columbus, who lived two hundred years later, was one of those who studied the book, and it helped him greatly when he was making up his mind to try and find India by sailing over the sea to it.

Marco Polo, the first European traveler to China, who walked to China as a boy and grew up at the King's Court.

To show how hard Marco Polo found it to make people believe the account of his travels, we must read the story of what happened when he and his father and uncle got back to Venice. Nobody knew them. Nobody would believe that the little Marco Polo who had gone away as a boy had become a great traveler and come back a rich man. So the Polos asked their old friends to a great feast. First they appeared in robes of crimson satin; then they changed these for other robes, and at last they came into the room wearing the torn, soiled old clothes which they had worn in their wanderings. Their friends stared in surprize, and were still more startled when the three men cut open the patches of the old clothes and showed that these were filled with jewels. Then the people believed that the strangers really were the Polos, back from the far-off lands.

This is another quaint picture from the Book of Marvels. It represents Marco Polo landing at Ormuz, a once famous city near the coast of Persia.

THE MAN WHO FOUND AMERICA

THE STORY OF CHRISTOPHER COLUMBUS AND HIS DISCOVERY

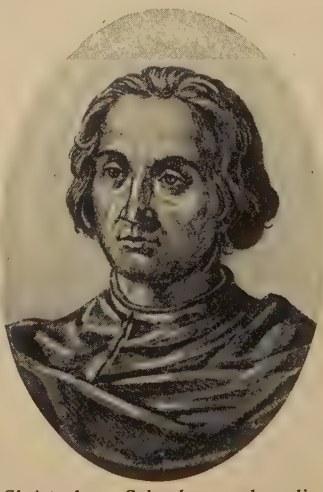
CHRISTOPHER COLUMBUS did a greater thing than he knew. He thought that he discovered India; but it was not India which he found by sailing out over the great unknown sea. It was new land — America,— though he died before the country was called by that name. Columbus never heard the name America.

Columbus was very poor as a boy, but he was clever, and learned all he could about geography and travel. He was brave, too, and went to sea as far as ships commanded by other men could carry him. Once he was wrecked and almost drowned. Whenever he could, he read about Marco Polo's travels and other great adventures. He was born at Genoa, in Italy, and when he grew up he asked the rich people of his native town to provide him with a ship to go and look for new lands. For he did not believe that the earth is flat, as most people did at that time; he believed it to be round. He knew that India was far away at the back of Italy, where he lived, and he thought that it was part of a very great continent which reached far round into the sea on the other side of the world. And he thought that if he sailed out across the ocean to the west he would come to the western side of India.

The people of Genoa would not have anything to do with such a scheme, so he went to Portugal and asked the king to help him. Now, this king was already sending out men and ships to explore the coast of Africa, and he thought there might be something in the plan of Columbus. But he was a bad, deceitful man, and secretly sent other men with a ship to do what Columbus had asked to be allowed to do. But the men on the King of Portugal's ship were cowards and turned back, frightened by the great sea.

The ship, named the Santa Maria, in which Columbus sailed to America. It was from the deck of this ship that the New World was first seen by men from the Old World.

When he heard what was being done, Columbus was angry and sad, and went away at once, and wrote to the King of England for help. Before anything could come of this, he went with his little son to Spain, and though the King of Portugal sent for him to go back, he would not. He went next to a Spanish duke, who could not help him, but sent him to King Ferdinand and Queen Isabella of Spain. Spain was at war with the Moors, and the plan of Columbus was put off from time to time, until at last he went away, heavy of heart, resolved to go to France. He was so poor that he had to stop at a monastery and beg for bread for his little boy. The monks took him in and were charmed with his strange talk. One man there happened to be a friend of the Queen of Spain. He wrote at once to her telling her how important was the plan of Columbus,



Christopher Columbus, who discovered the American Continent, but thought it was part of India.

COLUMBUS BRINGING THE NEWS OF THE DISCOVERY OF AMERICA TO THE KING AND QUEEN OF SPAIN IN APRIL, 1493

Columbus began life as a poor boy, but he grew up to be received in triumph at the Court of a king. He had no encouragement to set out on his great voyage of discovery until the Queen of Spain pleaded for him. Then men and ships were lent to him, and he sailed to find America. This picture shows him in the palace at Barcelona, on his return, telling the King and Queen of Spain of his discovery. It is strange to think that Columbus, who was so honored by a king, died poor and lonely, as he was born.

and she sent for Columbus to go again to Court. But once more he was disappointed. He was kept waiting about the Court, the queen being engaged in games while the man who was waiting to discover the New World was sorrowing in neglect. He set off for France at last, and then the queen knew that he really was in earnest, and this time had him brought back, and caused three little ships to be fitted out for him.

He set sail on Friday, August 3rd, 1492, when he was forty-six years old. It was a strange and wonderful voyage, over an ocean which, so far as he knew, nobody else had ever sailed. His crews were terrified and wanted to turn back, and he had great difficulty in making them obey. They sailed on for two months and a week, and then, at ten o'clock on the night of October 11th, 1492, Columbus saw a light shining in the darkness. He thought that land was there, and next morning he found that he was right. There before them lay a beautiful island. Columbus dressed himself in his richest clothes, and, bearing the banner of Spain, he went on shore. There he made all his crew kneel down and bless God, and kiss the ground, and give thanks for God's mercies in bringing them to this place. Columbus then claimed the island for the King of Spain, and went on his way finding other islands. These islands he thought must be the western islands of India, because the East Indies were on the other side of the world. So he called them the West Indies, and called the people on them Indians. They were not Indians, but so they were called, and all the red men in America were called Red Indians for the same reason. It was America that Columbus had found, but he thought it was India.

He discovered another island, which is called Cuba, and a third, which he called San Domingo, now named Hayti. One of his ships was wrecked, so he took the wood from her and built a fort with it at Hayti. In this he left some of his men, and then returned to Spain. He

CHRISTOPHER COLUMBUS FIRST SIGHTING AMERICA IN THE YEAR 1492

Columbus, in his voyage of discovery, had often to keep up the courage of the sailors in sailing through unknown seas, as they grew discontented at times and wanted him to steer the ship for home again. When he saw the land he was in search of, his men, who were just about to mutiny, grew shamefaced before him.

was received with great honors, and soon set out again for the West. He made more discoveries of islands, and still more in the third trip. Although he had done such a great thing, Columbus was made very sad by his enemies. Men were angry because of his success, and told spiteful and false tales about him. Once he was put in chains, like a common thief. He was very poor and very lonely when he died.

America was the name given to the land after Columbus died. A man named Amerigo Vespucci explored the coast which Columbus had discovered, and found that it was not the coast of India. "It is a New World," he said. For a long time the land was called simply the New World, but at last it was decided to call it after the man who had found that it was not India. It was called America, after Amerigo, instead of after the name of the man who found it. America was discovered by Columbus in 1492. It was not named America until the year 1506.

This is Amerigo Vespucci, who proved that the land Columbus found was not India, but a separate continent, and after whom the land was named America.

FINDING THE WAY TO INDIA BY SEA

VASCO DA GAMA AND THE FIRST VOYAGE ROUND THE CAPE

THE people of Portugal thought that Columbus had discovered India by sailing to the west, so they made up their minds to discover it by sailing to the east. To do this they had to go from Portugal right down the west coast of Africa. Now, although a brave sailor named Diaz had discovered that the coast did not go on for ever and ever, and that there was an end to it, nobody had ever dared to go round the Cape of Good Hope, which Diaz had found. It took a hundred years of exploring to find that there was such a place as the Cape, for men were afraid to sail out into the open sea in those days; they kept close to the shore, and dared not go far beyond the place from which they started, for fear they should never be able to get back. But now King Emmanuel of Portugal fitted out three ships, and sent a nobleman from his Court to see what he could do.

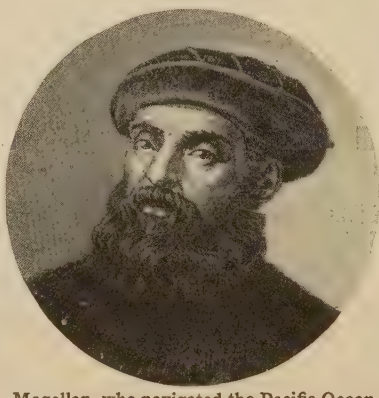
This nobleman was named Vasco da Gama. His men were just as frightened as those of Columbus had been. But he kept on and on, and at last reached the Cape of Good Hope, and found that he could get round to the other side of Africa. Terrible storms seemed likely to swallow up his ships. His crew begged him to go back. "I will never go back until I have set foot in India," he said. Some of the men made up their minds to kill him, but he put these men in irons, and himself took command of the steering of the ship. They reached the Indian Ocean, and, sailing along the east coast of Africa, found great cities. At one of these they were able to get a pilot who knew the way across the waters. They reached Calicut, in India, at last, and tried to make friends with the King of Calicut. He was a bad man, and, after taking their presents, tried to kill them. They managed to return to Portugal, having found out one of the most important things in the world—the way to India by sea.

Vasco da Gama, the Portuguese explorer, who first sailed to India round the Cape of Good Hope.

THE FIRST VOYAGE ROUND THE WORLD

MAGELLAN & DEL CANO & HOW THEY FOUND THE PACIFIC OCEAN

THE first man to sail round the world was only a lieutenant. His name was Sebastian Del Cano, and when he set sail on the voyage he had for his leader the great Ferdinand Magellan. The ships went out from Seville to the west on September 20th, 1519, and returned from the east on September 8th, 1522, three years all but twelve days. But when they got back, instead of the five ships and 270 men with which they had started, they had one ship and thirty-one men. Del Cano was in command; the brave Magellan was dead. To understand what had happened we must go back a little.



Magellan, who navigated the Pacific Ocean, and died before his ship reached home.

After the voyages of Columbus, the King of Spain still believed that India could be reached by sailing to the west. So he sent Ferdinand Magellan to seek the truth. Magellan was a Portuguese noble, who had left the service of his king because he had not been well treated in Portugal. He had already been in India by Da Gama's way, and had seen the famous Spice Islands. Now he set out to do what Columbus had failed to do—to reach India by the western passage.

He struck out boldly for what we now know as South America. Nobody had ever been able to get to the end of it; nobody could tell whether it was possible to get round or through it. Some of his men rose in mutiny, and one ship left him because the crew were too frightened to go farther; but he would not give up. He explored all down the coast, and at last came to a great opening. He sailed up it, hoping it would go right through. No; it was only a great river. He came back, and went on until at last the coast seemed to break in two. He sailed in through heavy waves into a channel which ran between great precipices. He was the only man not afraid. His men almost died of fright when a great storm arose. He managed to calm their fears, and at last they got through the strange channel. And then a magnificent open ocean appeared before them. It was smooth and calm, and he called it the Pacific, which means the "peaceful" ocean. That is how the great Pacific Ocean was named.

He had come through a strait which he called after his own name. The Magellan Straits had shown him the way past South America. To get through it had taken him thirty-eight days, so it is not surprizing that his men were afraid. He now sailed half-way round the world, and reached the Philippine Islands, where he was killed in a battle with natives.

Del Cano, who was Magellan's lieutenant in the first voyage around the world.

It was when Magellan died that Del Cano, taking the only ship fit to sail on, continued the voyage, still in strange waters, but knowing that he was steering for home. He came back round the Cape of Good Hope as Da Gama had come round from India. When he got home people saw that, as he had gone out by one way and come back by another, the world really was shaped like a ball, and that Del Cano had been round it.

The Magellan Straits are still called after the man who found that they lead to the East. Many attempts were made to follow Magellan, and after fifty years Sir Francis Drake sailed round the world from England.

THE NEXT STORY OF MEN AND WOMEN IS ON PAGE 127.

ALL ABOUT YOURSELF

THE greatest wonder in the world is Life. What is it that makes us move, and breathe, and feel? Nobody knows that. But there is a greater wonder still than breathing and moving and feeling. Even animals can do these things. What is it that makes us think, and love, and hate, and pray? Only God knows. It is the world's great mystery, which no man yet has ever known. The world is a beautiful place filled with living things, and men and women and boys and girls are the masters of creation. We can measure the earth, and we know what the sun is made of, but we do not know the wonder of ourselves—what makes you YOU, what makes me ME. In this part of our book we shall be told all that we can know about the great mystery of Life.

LIVING THINGS AROUND US

By C. W. SALEEBY

OF all the interesting things in our wonderful world none are more interesting than the living creatures we find everywhere around us.

They are our own friends and relations. If we think of the moon, beautiful but dead, a great splendid tomb, we shall see what a difference there is between the moon and our own earth, which is the mother of all living creatures. No doubt there were once living creatures on the moon, too. If there were no animals, there were at any rate some plants. But the moon has now grown cold; she has lost all the air that she once had such as our own earth has now; she has not even a drop of water left, and so all the plants that once lived upon the moon are dead now, they and their children. How different is the earth! Life fills the seas, covers the dry land, and flies in the air above. Everywhere there is life and movement, and birth, and death, and new birth; always and everywhere there is life and more life. These are the most interesting facts of the world we live in, and we must ask ever so many questions about them. For instance, what is the difference between a living thing—like a fly, or a rose, or a child—and a thing that is not living or that never has lived—like a stick, or a stone, or the gravel or clay in the garden? Then again, what are the different kinds of living things? How is it they are so different? An elephant is very different from a piece of moss, yet an elephant is much more like a piece of moss than it is like a piece of flint. How is this?

How can we tell whether a thing is alive or not? What is the difference between a living thing, like a boy or a rose, and a thing that is not living, like a stick or a book?

The business of our lives is to ask questions, to try to answer them, and to act and live in obedience to the answers; and after we have answered these questions, there remain many more to puzzle us. We know that living creatures die,

and yet life does not die; there is no living thing on the earth now that was alive 2,000 years ago, except, perhaps, a few great trees like the cedars of Lebanon, of which we read in the Bible. All the living things that were alive then—fishes and flies and birds and flowers—are dead now; and yet the earth is filled with life, and never was so filled with life before.

Why is it? It is because of a very wonderful fact, the fact that all living things have children, and that these children are like their parents, and that when the parents die the children carry on their lives. There is an old Greek story of the runners who had to carry a flaming torch, and as one runner fell, tired out, he gave the torch to another; and so, though the runners fell, and could not reach the goal, the torch was not put out, but went on burning. The torch is like the flame of life, and each living creature is like the runner who runs for a little while, and hands on the flame of life to the children who will carry it on when he is gone.

There is an old story of the runners who had to carry a flaming torch, and as one runner fell, tired out, he gave the torch to another, who carried it and handed on the flame still burning. So every boy and girl carries on life.

Where have all these living things come from? We know that all things, living and dead, have come from God, who sustains them from everlasting to everlasting. The questions for us are: How did all these kinds of living things come into existence? What is their history? Who were their parents? It is only since the days when our grandfathers and our grandmothers were children that men have learnt the truth about this, and it is well for us that we have been born in the days when this truth and so many others have become known, for the more truth we know the better it is for our lives.

We will begin by asking ourselves this question: "How can we tell whether a thing is alive or not alive?"

"Now that is really silly," you may say, because anyone can tell in a moment that the fly is alive and that the windowpane is not alive. We know that the fly is alive, just as we know that a little boy is alive—because he is so lively. We call anything alive that moves about itself, anything that jumps, or shouts, or swims, or flies. We say this, but is it true to do so?

Really it is not true. When we come to think of it, the little boy is still alive even when he is fast asleep. He is just as alive when asleep as he was when he was playing before he went to bed. Some wise little child may say that this is not really a good argument at all, for even when the little boy is asleep he still moves, for we can see him breathing. Now that is quite true, for if we look at the sleeping boy, and then at the doll that may be lying in the same bed, we see that the boy's chest moves up and down, while the doll's chest does not; and if we put our hand to the boy's chest very gently we may feel his heart beating with our fingers. The heart has not gone to sleep; it is still moving, and it is moving because it is alive.

So that, after all, the boy is lively all the time, whether he is asleep or awake, and the real question is whether a thing which does not seem to move at all is alive like the boy. Must anything really alive be really lively like the boy? We shall see.

We can imagine how a bird, flying high in the air, is able to look down upon the surface of the earth. If we have been up in a balloon we can understand what is meant by a birdseye view. A birdseye view is a view that the bird has of the world when it is up in the sky; it sees everything at once. Now, it is always necessary to take a birdseye view of anything that we are trying to understand.

If we take nothing but short views of one thing at a time, our ideas will be as silly as a fly's idea of an elephant must be. We must see one thing at a time, and all things together—we must

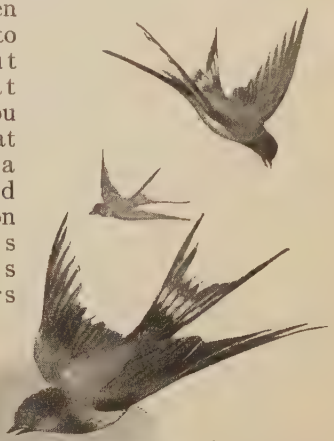
take both sorts of views. Let us try, then, to take a birdseye view of living things.

When we do this we see that there are two great kinds of living things, and that they are very different from each other. The difference is not in size or quantity, but in kind or quality. The one kind of living things we call animals, and the other kind we call plants; and a big animal, such as an elephant, is much more like a little animal, such as a fly, than it is like a big plant, such as an oak. A big animal is not like a big plant, nor is a little animal like a little plant. They are both quite different. What is the difference? Well, there are many differences, but the difference we notice first when we take our birds-eye view is a difference of liveliness. Animals move about themselves, and plants do not.

Shall we say, then, that plants are not alive? That has often been said and thought, because men thought that if a thing was to be called alive it must be lively. We know that plants are not lively, like a boy or girl; you can always find a rosebush where you left it in the garden, but the cat is not always where you left it. So men thought that because plants did not walk away they were not really alive.

And then men came to see the truth of what we have already said—that, after all, there is something about a rose which makes it more like a fly than it is like a piece of stone, even though the fly can fly and the rose cannot. So men thought that there were two kinds of life: one was real, true life, like the fly's life, or the tiger's, or yours, and the other was a sort of half-and-half life, not the real thing, but a kind of feeble imitation of it, just enough to make a difference; and men said that that kind of half-and-half life was shown by trees and plants. The men who said these things did not understand very much about them. They knew that there was something strange about the oak and the acorn, but they could not persuade themselves that anything which was not *lively* was really and truly *alive*.

But men began to find out things at last. You know that when a child climbs on to its father's shoulders it can see much farther than when it is standing on the ground; and that is like what men did. One man learnt something, the next man learnt a little more, and the man who came after him learnt a little more still; and so the world became wiser and wiser. We know to-day all that the men who lived before us knew, and we have also learnt something that they did not know; so that when our learning is added to theirs, it is as if we were standing on their shoulders and taking a wider view of the world than they were able to take. As men learned more about the world they were able to get a birdseye view, and the result of all their thinking is that we know now that plants are just as much alive as animals. In some ways plants are more alive than animals, even though they are not lively. The difference is that the life of the animal shows itself in liveliness, but the life of the plant shows itself in something else.



We must take a birdseye view of the world and of our lives. When a bird is high in the air it sees all the things at once, and we must try to take a birdseye view of anything we want to understand.

We know the animal is alive because it is lively, like the boy—like you. Your life shows itself in your liveliness. But we know the plant is alive because it helps the animal to live and to be lively, and for many other reasons.

Though the plant is very quiet and still, its life is very important, because it makes the liveliness of the animal possible. For the animal lives on the plant, and, if there were no plants, all animals, even we ourselves, would die. It is very ungrateful for the animal to live by the life of the plant, to turn the plant's life into liveliness, and then to say that the plant is only half alive, or that its life does not really count.

Animals make a great noise, but plants do just as much work, only they do it quietly. We need not always be shouting and jumping, and barking or blowing a trumpet to prove that we are alive. Plants do none of these things, but their life makes all other life possible.

We know the kitten is alive because it is lively. The oak tree is not lively, but we know that it is alive because it grows. The same life that makes the kitten lively makes the acorn grow, first into a plant, then into a great tree, and we see from this that a thing may seem quite still and yet be alive.

We see now that life means more than liveliness. Many things that are not lively are really alive, but all living things do not make a noise and walk about. You may look at a thing and never see it move for a day, or a week, or a year, yet it may be alive. Life means much more than the idea of something which moves by itself.

Movement is not really life, because *everything moves*. Plants do not walk about the garden, but they move by themselves. When the acorn grows into an oak, it moves upwards. When the sunflower faces the sun as it grows, it moves not only upwards, but in other ways also; and if we take the leaf of a plant and look at it through magnifying glasses, arranged so as to make what is called a microscope, we can see for ourselves that the tiny specks of green stuff which give the leaf its colour are moving all the time.

Everything is moving. The old idea that liveliness is life and that nothing else is life is seen to be quite wrong and short-sighted, and not a birdseye view at all, because we find that everything moves, whether we can see it or not. The tiny specks of stuff that make up a pebble are always moving, and so are the black specks that make the ink on this page. If liveliness means life, then all things are alive, for all things are lively if only we see them clearly enough.

This is important to understand if we are to think properly of the life of the plant. Perhaps movement is the most important thing; some have thought, if we could really see deep enough we should find that life itself is really a very special kind of movement or liveliness. But if life is just a special kind of movement, it is so very special that of course it makes all the difference whether a thing has this movement or not. The best way for us to understand what it is that really makes a thing alive is to study very simple kinds of life. The most simple kinds are plant life or vegetable life; some are lively and some are not lively, but they are all alive. If there were no plants animals could not live. Plants are older than animals; that is to say, there were plants on the earth before there were any animals, and the first kinds of animals were the children of the first kinds of plants. These are only a very few of the reasons why we should study plants, without any silly idea that they are really not worth studying. If plants were not here to study we should not be here to study them. This is just one way of saying what we must always remember—that all living things belong to one another, and that unless they were always serving each other they could not exist.

THE NEXT PART OF THIS BEGINS ON PAGE 185.

THE CHURCH AND MISSION STATION OF FATHER DAMIEN IN THE SOUTH SEA ISLANDS

THE SACRIFICE OF FATHER DAMIEN

TWO brothers in Belgium were in the same college preparing to become priests. The elder brother was soon to become a missionary, and go away to the South Sea Islands. His eyes used to sparkle, and he would rub the palms of his hands together, smiling and showing all his teeth, whenever he spoke of the work that waited for him across the sea.

One day, however, he was taken seriously ill, and was carried to his bed. Fever wasted him. He fretted and grew pale and melancholy. His younger brother came to his bedside and said softly, "Would it make you happier if I took your place as a missionary?" The eyes of the sick man lighted up for a moment, and he squeezed his brother's hands, smiling. Then the younger brother wrote secretly to the authorities, begging that he might go in place of his brother.

As he sat at his books one day, the superior of the college came and told him that he was to go. The boy sprang up, rushed out of the room, and careered about the playgrounds like a wild animal.

"Is he crazy?" asked the other students.

And why should Joseph Damien have been so glad to go into exile? Why should he wish to forsake the happy land where people spoke his language, and where all the customs and habits were so familiar to him? Why want to go and work among savages, far away out across the wild seas, unseen and forgotten by his friends?

Well, he had already given up the world to become a priest, and so it was clear that he was glad to become a far-away and forgotten missionary because he loved, more than the pomp of the world, more than the happiness of home, more than the love of father and mother, the Saviour who went about doing good, and who called upon all who loved Him to take up their cross and follow Him.

Joseph Damien, bubbling over with the excitement of a boy, started out for the South Sea Islands and became a missionary. He worked nobly and well till he was thirty-three. Then, while he was working among the people, he one day heard the good bishop say that, alas! he had no one to send to the poor lepers in Molokai, and that these poor, stricken creatures were abandoned to this most dreadful disease and to the most dreadful sins.

Joseph Damien, whose heart had often grieved at stories he heard of the lepers, begged the bishop to send him, and the bishop accepted his offer.

So here was another "giving-up," for to go from the savages to the lepers was a far greater sacrifice than going from Belgium to the savages. The lepers

lived all by themselves, separated from healthy people, shunned by all mankind. They were outcasts. The dreadful misery of their bodies made them evil in their souls. Their hovels were like pigsties; they lived no better than beasts; they were horrible to look at and viler to know. You cannot imagine the horrors of Molokai. If I were to tell you a quarter of them, it would make you ill.

But Father Damien came to these outcasts with the simple message that God loved them; and his cheerful face, his caressing voice, his loving eyes, and, above all else, the living faith that was in his words, changed them from beasts to men, and presently from men to children of God. They began to be ashamed of their sins; they began to feel that perhaps God did really love them after all. One thing was true. Father Damien loved them.

FATHER DAMIEN, WHO GAVE UP HIS LIFE

He went out from Belgium to help the lepers in the South Sea Islands. He left his own country and became a leper, giving his whole strength and at last his life to these afflicted people. This portrait is by Edward Clifford, photographed by F. Hollyer.

For sixteen years this holy and devoted man lived among the lepers. He built them a church, which they loved, he built them better houses, he gave them a proper water supply, he nursed them, he dressed their frightful wounds, he comforted them when dying, and he dug their graves for them when they were dead. And people in the great world outside heard of this lonely priest toiling among the lepers. People wrote to him, sent him cases of comforts for his people, and some even came out to see him and help him. For many years he worked among his poor afflicted people, but at last he too fell a victim to the dreadful disease.

One day the warning came. He happened to spill some boiling water, which splashed upon his foot. He was surprised to find that it did not hurt him. He went to a doctor. "Have I got leprosy?" he asked. "I hate to tell you," said the doctor; "but, yes, you are a leper." From that moment Father Damien said in his sermons, not "my brethren," but "we lepers."

He was perfectly happy. He said that if he could be cured by forsaking the island he would not desert the lepers. So he worked on as a leper, with death creeping swiftly and fiercely through his body.

When he was carried to his bed, he thanked God for all the blessings and comforts he received. Two priests and Sisters of Charity knelt at his bed.

"When you are in heaven, Father," said one of the priests, "you will not forget those you leave orphans behind you?"

"Ah, no!" smiled the good Father. "If I have credit with God, I will pray for all in the *Leproserie*."

"And will you," whispered the kneeling priest, "like Elijah, leave me your mantle, my Father?"

"Why, what would you do with it?" asked Father Damien. And then he added slowly, "*It is full of leprosy.*"

What a fine coat to put off after one's life's work! No king ever wore a finer.

And soon the soul of Father Damien was received by the angels. His whole life had been a golden deed.

CONTINUED ON PAGE 137.

THE FIRST GREAT BOOKS

ALTHOUGH almost every child is familiar with Lamb's Tales from Shakespeare, we are not to suppose that his are among the world's oldest books. Indeed, they are like stories of yesterday compared with others that exist in the world's great library. The oldest story that we know of is called "The Shipwrecked Sailor," and was written in Egypt 2,500 years before the birth of Jesus. The idea of Sindbad the Sailor may have been taken from it. But the oldest real books are the "Iliad" and the "Odyssey," supposed to have been composed by a Greek poet named Homer between 800 and 1,000 years before the Christian era. Perhaps he brought together the work of other poets as well as his own; certainly the great poems that bear his name were not all by one poet. The greatest Roman poet, Virgil, was born just 70 years before Christ, and his most famous work is the "Æneid." These three may be called the first famous books.

THE WAR FOR A STOLEN QUEEN

THE STORY OF THE "ILIAD"

WE should know the meaning of the word "Iliad" before we can listen to the story. It is the English form of a Greek word that means "about Ilium," and Ilium was the name of a town that stood on the coast of Asia Minor. It is usually referred to in English as Troy, and it was the capital city of Troja; but it was known to the Greeks as Ilium. Its inhabitants were called Trojans. The "Iliad," which was composed by Homer, a Greek poet, nearly three thousand years ago, tells of a great war carried on by the Greeks against the Trojans, but what is true in it and what is the fancy of the poet we cannot very well say, as fact and fiction are mingled together.

The King of Troy was named Priam, and the name of his wife was Hecuba. Of their many sons, Hector was famed for his bravery and Paris for his good looks. It happened that Paris was sent on an embassy to Menelaus, King of Sparta, in Greece. This King was married to Helen, a woman so fair that she was thought to be the most beautiful woman in all Greece. When Paris arrived in Sparta, the king was away, and Paris was false to him. He made Helen a captive and carried her off to Troy. Greece, which is a land of many islands, was not then united under one king, but had many independent rulers and princes. So when the King of Sparta found that his queen had been stolen away, he called together a great meeting of the princes, and his own brother Agamemnon was elected "sovereign lord of all the Greeks" to lead them in a war against the Trojans for the recovery of Helen. At the marriage of Helen and Menelaus the Greek princes had promised to defend the beautiful Helen if any need arose.

The blind Greek poet who lived nearly 3,000 years ago and composed the "Iliad."

The story then goes on to tell us how the Greeks made preparations for the war, how the army was reviewed, and how the boats for carrying the soldiers were got ready.

It tells also of the many famous warriors who were to take part in the war. Chief among these was Achilles, the bravest of the Greeks; then there was Ulysses, the wisest; while Nestor was the oldest and most experienced of them all. When all was ready,

the mighty army set sail for Troy, and, landing on the shore, soon laid siege to the city. For ten long years the siege continued, battle after battle was fought and also single combats between the leaders, but no decisive victory was won.

Thus nine of the years had worn away when trouble began among the Greeks themselves. A great quarrel arose between Agamemnon and Achilles over a very little matter—a slave who had been given to Achilles having been taken away by Agamemnon. As a result of this quarrel, Achilles withdrew to his tent, and would not support Agamemnon in any of the next skirmishes that took place between the Trojans and the Greeks. Growing bold, because the mighty Achilles fought no more, the Trojans now began to press the besiegers. Fearing that the Trojans might even score a victory, the noble Greek, Patroclus, the dearest friend of Achilles, dressed himself in the armor of that powerful warrior, and led the Greeks once more against the Trojans. He drove them back into their city, but fell, mortally wounded.

Achilles was the bravest of the Greek soldiers who fought in the war against the Trojans.

Achilles had now more reason than before to make war against the enemy that had killed his well-loved friend. Arrayed in a new armor made for him by Vulcan, he goes forth to avenge Patroclus, and is met by Hector, the finest fighter of all Troy. Now takes place the greatest battle of the long war. Hector soon falls before Achilles in his wrath, and the body of the Trojan prince is dragged three times around the city at the chariot of his conqueror before it is given to Hector's father, Priam, who bears it back within the walls of Troy, where the dead hero is mourned by Hecuba, his mother; by Andromache, his wife; by the captive Helen, and by all the Trojans. A great funeral is given to the hero of Troy:

"Perform, ye Trojans! what the rites require,
And fell the forests for a funeral pyre;
Twelve days, nor foes nor secret ambush dread;
Achilles grants these honours to the dead."

Thus commands Priam, the king, and with a short description of the final honors paid to the dead hero the story ends. But this, of course, was not the end of the war. The chief purpose of Homer's great and lengthy poem is to show what Achilles did during the siege of Troy, and not to give a complete account of the war.

THE STRANGE ADVENTURES OF ULYSSES

THE STORY OF THE "ODYSSEY"

AFTER the Trojan War the Greeks returned home, but Ulysses was fated to wander for many years before he regained his native land, and the "Odyssey" contains the stories of his adventures during those years. The Greek name for Ulysses was Odysseus, and so the word "Odyssey" means "about Odysseus."

When the Greeks set sail from the coast of Asia Minor to return to their own beautiful homes, none of the princes was more anxious to regain his native land than the wise and brave Ulysses. But, in spite of all that his sailors could do, adverse winds drove his ships far from the isles of Greece. At home his wife, Penelope, and his son, Telemachus, were waiting for him, but they had to wait for ten long years after the Trojan War, and during those years the wanderer had twenty adventures. We can only mention a few here.

Ulysses was a princely soldier of Greece, who wandered by sea and land for many years after the Trojan War.

Instead of being carried towards Greece, the ships of Ulysses were blown along the coast of Asia Minor, and, being sore pressed by hunger, he and his men at length were forced to land and attack the inhabitants of a small town, who fled before them. The Greeks, with plenty to eat and drink,

gave themselves up to merry-making. Meanwhile, the inhabitants came back and attacked them, slaying more than half of the sailors who had landed. The others had a narrow escape in returning to their ships.

Ulysses and his men who thus escaped landed afterwards on the island which we now call Sicily, and here they wandered about until they came to a great cave. In this cave were huge pans of milk, and the place showed other signs of being inhabited. It was, indeed, the home of one of the fabulous giants who, like all the gods and goddesses of these ancient stories, existed only in the imagination of the people of that time. The giant was named Polyphemus, and an uglier or more cruel giant it would be difficult to imagine. He had only one eye, and it was set in the middle of his forehead. He was chief of a race of one-eyed giants called Cyclops.

By tying each of his men below a giant sheep, after he had blinded the giant, Ulysses and his men escaped from the cave when the blind giant drove the sheep out in the morning.

Ulysses and his men were waiting in the cave that evening when the giant came home, driving before him a flock of giant sheep, and rolling before the entrance a stone which twenty ordinary men could not have moved. To him Ulysses came forward and, offering a skin of wine—for in those days bottles were made of skins—pleaded for mercy for himself and his men. The giant drank the wine and was delighted with it. He promised a boon to Ulysses for his gift; but as he immediately proceeded to eat up two of the Greeks, it was clear they could not hope for any mercy from this monster.

After his long years at Troy and his many adventures, Ulysses returned safe to his wife and his son.

Polyphemus then asks Ulysses to tell him his name; but the prince is too wise to let him know who he is, so he replies:

"No-man is my name.
By that distinguish'd from my tender years,
'Tis what my parents call me, and my peers."

The giant then: "Our promis'd grace receive,
The hospitable boon we mean to give:
When all thy wretched crew have felt my power,
No-man shall be the last I will devour."

Six days of terror pass by, and the giant each evening reduces the followers of Ulysses by two before the wise prince hits upon a way of escape. On the seventh night, while Polyphemus lies stretched upon the floor asleep, Ulysses sharpens a great stake of wood, and, assisted by his men, this is run into the eye of the giant, whose roars of pain awaken others of the fabulous inhabitants of the island, but they cannot enter owing to the stone that blocks the cave. So they call to their great chief to know who hurts him, and from his den he answers:

"Friends, No-man kills me; No-man, in the hour
Of sleep, oppresses me with fraudful power."

To this they call back:

"If no man hurt thee, but the Hand Divine
Inflict disease, it fits thee to resign."

Then they go away and leave him. But all the Greeks together are unable to move the stone, and so they have to wait till dawn, when the giant himself, now blinded, pushes the stone away to let his flock of enormous sheep go forth. He himself sits by the entrance, meaning to prevent the Greeks from escaping. But Ulysses has been wise enough to expect this, and has had one of his men bound under each of the sheep, so that as

the animals pass through the door they carry all the Greeks with them. Ulysses and his crew escape to the ships, and so ends the third of his wonderful adventures.

A stranger adventure still befalls the Greeks when, in their wanderings, they come into the hands of a witch named Circe, who gives them wine to drink that turns them into beasts. Here, again, Ulysses is too wise to be caught by any snare, and refuses to drink the wine. It is well for him that he does, as his wisdom makes the witch admire him, and for his sake she restores all his companions to their natural shape.

Many of the adventures of Ulysses are full of meaning for us, and teach us valuable lessons if we care to take them. One of the most interesting is the adventure of the Sirens, who are beautiful singing maidens that sit along the shore and sing so sweetly that sailors are tempted to come to land. But these Sirens are really furies, who kill the men that land, and strew their bones along the shore. Here, again, the wisdom of Ulysses secures the safety of his crew. He puts wax in the ears of his sailors so that they may not hear the singing of the Sirens, and thus they row safely past their land.

Their next adventure is the sailing between a rock called Scylla and a terrible whirlpool called Charybdis, which Ulysses succeeds in doing. But we must now come to the end of these extraordinary adventures and see Ulysses landed safely on the barren shores of Ithaca, the Greek island of which he was the king.

Twenty years have passed since he first sailed away to take part in the great war against the Trojans, and all this time his wife, Penelope, who is famed for her goodness, her beauty, and her wisdom, has been patiently awaiting his return. Many other men have been anxious to marry her, and have come to the palace, saying, "Ulysses is dead, or he would have returned ere now." But she has refused them all, telling them she would never wed again until she had woven a shroud, and as she undid each night what she had woven during the day, the shroud was never made.

When Ulysses reached his palace, some of the princes who wished to marry Penelope were there. Nobody but his old nurse and his dog knew the king, who was so changed in his twenty years of wandering. But Ulysses told his son, Telemachus, who he was, and together they killed the princes who had been annoying Penelope. Then Ulysses sought his wife, who at first could hardly believe it was her husband back again, but at length was overjoyed to think her wise and noble king was safe at last and all his wanderings done.

THE VICTORY OF THE WOODEN HORSE

THE STORY OF THE "ÆNEID"

AMONG the Trojan princes who took prominent parts in the great war there was one named Æneas, and nearly eight hundred years after Homer had written those two great poems in praise of Achilles and of Ulysses, Virgil, the Latin poet, followed the style of Homer by composing the great poem known as the "Æneid," which means "about Æneas." The real purpose of this poem was to please the Latin people and their rulers by showing how their kings had descended from this great Trojan prince, the story of whose life had ceased to be true history, and had become, for the most part, pure fable.

We have now to learn how the Greeks succeeded in destroying the city of Ilium, or Troy. It was due to the wisdom of Ulysses that the long siege ended in victory. He it was who caused an enormous wooden horse to be built, and inside of this were concealed a number of Greek soldiers. This very strange erection was wheeled to the gates of Troy and left there. Then all the other Greek soldiers got into their boats and pretended to row away, as if they were tired of the war. The curiosity of the Trojans got the better of them, so they went outside and, at great pains, drew the wooden horse within the walls of the city. In the night the Greek soldiers inside of it crept out and took the Trojans by surprise, while the main army, which had made a pretense of going away, came back and joined in the siege. Troy was

THE STRANGE WOODEN HORSE OF TROY

The Trojan War was ended, after ten years, by Ulysses. The Greeks built a huge wooden horse, hid some soldiers in it, and pretended to sail away. The Trojans came out to draw the horse into the city, and, finding the gate too small, broke through the wall. In the night the Greeks returned, and their friends came out of the horse and opened the city gates while the Trojans slept. So the Greeks captured the city.

soon in flames, its inhabitants killed or flying for their lives. The beautiful Helen, who was the cause of all the trouble, was restored to her husband, Menelaus, and so the famous siege was at an end.

The story of the "Æneid" does not begin by telling us this, but opens with the description of a terrible storm which overtakes the fleet of Æneas, who, after the fall of Troy, from which he had escaped, carrying his father on his back, but losing his wife, had gathered together many followers, and put to sea, setting sail, after seven years, for Italy.

In this great storm many of his ships are wrecked, but his own boat and six others arrive safe at an African port, and he finds himself in the rich and wonderful region of Carthage, to whose queen, the lovely Dido, he tells the story of the fall of Troy and the wooden horse which we have just heard. He also describes his different voyages after his escape up to the time of coming to Carthage. Dido herself grows to admire this noble prince and wishes to marry him, but he is warned to leave Carthage, and no entreaties of the queen will make him stay. In her despair at this she kills herself.

After sailing to Sicily, where he celebrates the memory of his father, Æneas is supposed to visit the Elysian Fields, where the ancients thought the souls of people went after death, and there he finds his father, who shows him the race of heroes that is to descend from Æneas and is to rule over the Latin people.

Æneas sets forth, and reaches the land of Latium, or Italy, whose king, Latinus, entertains him well, and promises him his only daughter, Lavinia, heiress of the crown, as his wife. But another prince, named Turnus, King of the Rutuli, a Latin people, is in love with her, and is favored by her mother. So war is declared between the Trojans and the Rutuli, in which there are many stirring battles, and towards the end it looks as if the Trojans might be completely defeated in the absence of their leader. But Æneas, who has received a shield made by Vulcan, the fabled god who made the armor of Achilles, on which shield are shown the future glories and triumphs of the Latin, or Roman, nation, returns to the field in good time to change the fortunes of the war.

Priam was the king of Troy, and after the Greeks got into the city by the trick of the wooden horse, as told on page 77, Priam and his princes, as well as most of the Trojans, were killed by the victors.

In the last battle of all a single combat is arranged to be fought between Æneas and Turnus, but the followers of the latter succeed in wounding the Trojan prince. Æneas, however, is cured of his wound by his mother, Venus, one of the goddesses in whom the ancient Romans believed, and, forcing Turnus to fight a duel, succeeds in killing him.

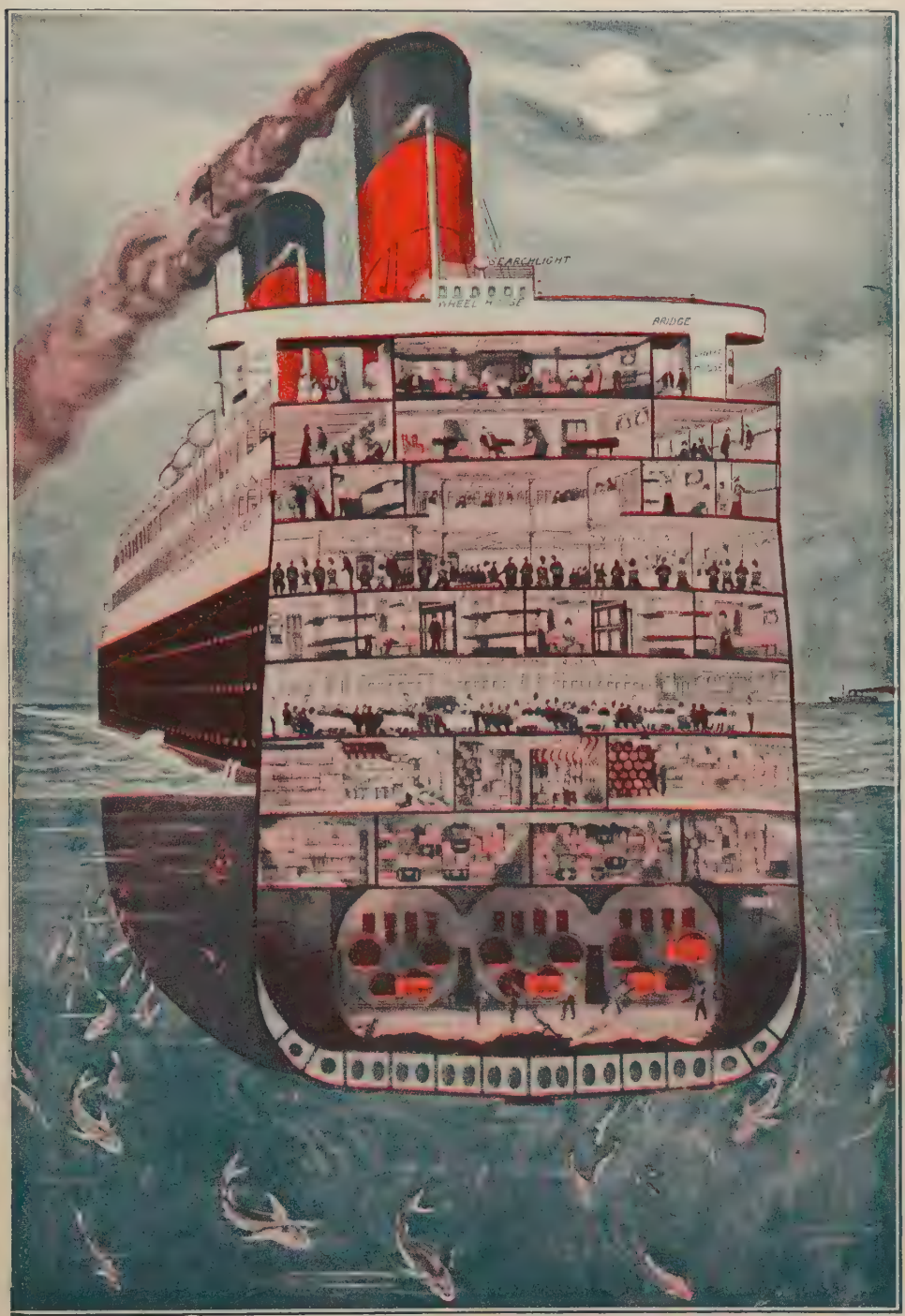
So ends the story of the mighty deeds of Æneas told in the "Æneid."

THE NEXT STORY OF FAMOUS BOOKS IS ON PAGE 195.

THE WONDER CITY OF THE WAVES

The passing of a ship at sea in full moonlight is a most impressive sight. The great ship seems to speak of the wonderful power of man as it sails along the waves with several thousand people on board. The opposite page will give us a glimpse of these people on board, living as comfortably as if in their own homes.

THE INSIDE OF THE GREAT SHIP BY NIGHT



This shows the inside of the ship on the other page, a big ship carrying 3,000 people. If we cut it in two, this is how it would look as it rides over the sea at night. It has ten floors. The captain's deck is at the top, with three decks below to walk on. Four times round one of these decks is a mile. Lower are the dining and drawing rooms; then come the sleeping-rooms, called state-rooms. Below is the baggage, and at the bottom, the sea beating against its walls, is the engine-room, with the great fires and boilers giving the ship its power.

WHAT THIS STORY TELLS US

THE sea is one of the busiest places in the world. Every day there are thousands of ships at sea, full of people and things—men and women and children, and animals, and goods of all kinds. Much stuff that comes into this country must come over the sea, and some of the ships that bring it are many weeks on the way. If we go to India we live on the sea for weeks, and for a long time we may never see land. But the good ship carries us safely through the water, with music, and food, and friends, and toys, and beds, and all we want on board. This story tells us how the ship rides on the sea, like a floating town.

THE HOUSE UPON THE SEA

CONTINUED FROM PAGE 37

IT is wonderful to read in the story-books of giants carrying us about the world, over the hills and far away. It is more wonderful to know that in real life there are giants who do things just as wonderful. The steamship is more wonderful than all the giants in the fairy tales, for the steamship is a giant that carries thousands of people. Suppose there are five people living in your house, and you all want to go to Europe. Well, two hundred families like yours from the same village, and two hundred families more from a second village, and two hundred more families from a third village could all go to Europe by the same ship.

That would be three thousand people, as many as live in a small town. But that wouldn't matter. The ship could carry them all at one time, and take their trunks and boxes, too. Instead of being in a city on land, you would be in a city on the sea, racing across the water faster than the fastest horse can run. You would get to Europe in less than a week. There would be no need to take food with you. The ship carries food and drink; it carries beds for you to sleep in, baths for you to wash in, books for you to read, cows to give you milk, hens to lay eggs for you. It has a telegraph office without any wires, from which, while still at sea, you can send a message to your friends on land.

For itself the good ship carries thousands of tons of coal and thousands of gallons of water. It must carry water wherever it goes, to make the steam which drives the ship, because the water in the sea is salt. If that salt water were boiled to be turned into steam, it would leave the dry salt behind, and choke the boilers. So the ship has to carry fresh water, which is cooled and boiled many times, or else it must have a machine to remove the salt from the sea-water.

This great ship carrying so many people and such heavy machinery is made to ride across the sea by the strongest giant that works for us. That giant is *steam*. It is just the same sort of steam which you see coming out of the kettle, only that which drives the ship is made hotter than that which curls out of the kettle-spout.

A hundred years ago most people would have thought a steamship a very wonderful thing. In those days they did not travel by steamships. There were no such things then. When a boy sees a pond, he likes to get a big piece of wood and make a raft, so that he can ride on the water. That raft is as good as the first boats which, long, long ago, men had to use. If they wanted to cross a lake or a river, they had to float across on an old log.

When men got to know more about making these things, they used to scrape out the inside of the log, so that they could ride inside, and not have their toes bitten off by crocodiles. Then they made better boats, and found out that they could make

them go faster by using sails and oars. The oars are long pieces of wood, with flat ends, which dip in the water, and when pulled through the water they make the boat go along. The sails are blown upon by the wind, and the wind drives them along, carrying the boat with them.

But for a long time men did not become much cleverer in making boats. They made them larger, but they had to use oars, or trust to the wind to drive them. When they made very big ships they could not use oars, and so they had only the wind to help them. When the wind did not blow the ship stood still, or was carried along by the water, perhaps where they did not want to go. John Paul Jones' ships were like this.

It took a long time for men to learn how to make a ship go by steam. Some men tried to do it, but people did not believe that it could be done, and would not help them. Many men tried and failed, and died broken-hearted. More than a hundred years ago a little ship was made to go by steam along the River Clyde, in Scotland. It pulled barges which were too heavy for horses, but people would not believe that it was any good, and that little ship was cast aside and neglected until it fell to pieces.

How a ship would look in a street. Behind are the blades which drive the ship through the water. The engines turn the blades round, and as they turn they push away the water and move the ship forward.

A few years afterward, Robert Fulton built the little "Clermont" and ran it on the Hudson River, and this little boat was the real forerunner of the great passenger ships that we know to-day.

Years after, a ship driven by steam went across the Atlantic Ocean to England. Everybody said that this was wonderful, but they did not think it could always be done, so nearly twenty years more went by. Then a clever man named Brunel built a ship called the "Great Western." It was driven by steam, and went from Bristol to New York in a fortnight, while the ships driven by wind took at least a month. Since then thousands of steamships have been built, and now we can get to England in five days.

What is it that this wonderful steam does? Deep down in the bottom of the ships men burn coal. The coal makes big fires in the furnaces, and turns the water in the boilers to steam. All the machinery of the ship is worked by this giant. At one end of the ship are shafts with three long blades. The steam turns these shafts.

When you twist a screw against a piece of wood, the screw makes its way into the wood, turning round and round and going forward. That is what the blades do when the steam makes them go round in the water. The water is all round the blades, and when they twist round, the water resists—that is, the water tries to stop the blades so as not to be pushed out of place. By resisting, the water becomes like wood, and the blades eat their way forward through the water, and so make the ship go. The faster the blades turn round, the faster the great ship travels, so that a ship weighing 50,000 tons rides along as smoothly as a cab, but so quickly that it can go a mile in two minutes. The wind may be blowing the way the ship goes, or against it; it does not matter to the ship. The great giant steam sends the ship the right way.

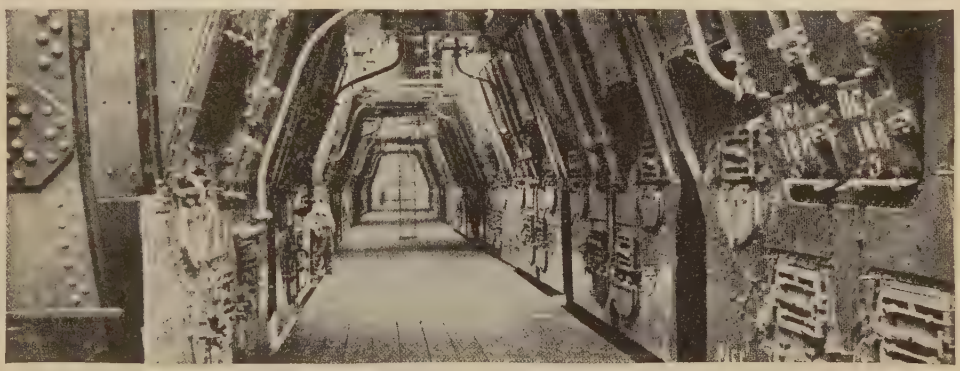
Many men work on these ships—sometimes 800 on one vessel. The hardest work is that of the stokers, who look after the fires. When you go on to a ship, you see people playing games on deck, or having dinner below, or reading in the library, or resting in the cabin. And right down under them all are the men keeping up the fires. Only an iron plate or so keeps the sea from these men. The heat is so great that cold air has to be pumped down by electric fans.

CONTINUED ON PAGE 121.

WHAT IT IS LIKE ON BOARD A GREAT SHIP

Every great ship has a doctor on board, and in his surgery he works as if on land.

Children sleep as soundly on the sea as if in bed at home. The beds are fixed one above the other in small cabins.



The great furnaces and boilers on a big ship would weigh more than a cathedral. The men walk through them as if they were in a street, with iron walls as high as houses. Behind these walls the fire is boiling the water and making the steam which drives the wheels of the engines round and moves the ship along.

This is how the officers of the ship talk from the deck to the men in the engine-room.

The rooms on a ship are beautifully furnished, and some of them are big enough to hold a thousand people. This is the dining-room on one of the great ships which cross the Atlantic many times in a year.

A TOUCH OF THE COUNTRY AT SEA

In this charming room afternoon tea is served to such as desire it. The vines which you see on the lattice-work in the back of the room are really growing. The palms are also growing in large tubs.

On the left is the greenhouse from which fresh flowers are picked daily. On the right is one of the storage-rooms for fruits and vegetables. The steward is checking off those which will be needed for the next meal. The fruit and vegetables are as fresh as those you get in a good restaurant.

THE AQUITANIA, ONE OF THE LARGEST SHIPS AFLOAT

The latest wonder of the Atlantic is 901 feet long and 57 feet wide. Set on end beside the Woolworth Building, which is 51 stories high, it would reach 150 feet above it. Its gross tonnage is 47,000 tons and its speed is 23 knots. It has eight passenger decks which afford accommodations for 3,250 passengers, and carries a crew of 1,000. On one deck are four large motor life-boats equipped with wireless apparatus. In case of accident these would tow the rowboats and rafts, carried for the rescue of passengers. The ship draws so much water that there are only a few ports to which it can go without danger.

CUTTING THE NEW WORLD IN TWO

This picture shows how the canal looks. It was begun in 1881 by De Lesseps, the celebrated builder of the Suez Canal, but had to be abandoned after $350,000,000 had been wasted. The United States took over the work in 1903. In 1907 Col. George W. Goethals was placed in charge. This great man put a huge army of men to work, and the big task of cutting the New World in two was completed, so that on August 13, 1914, the steamer Cristobal made a trial trip and two days later the Ancon opened the canal to the world by carrying its passengers and cargo to Balboa on the Pacific side. Now great ships pass through every day unless blocked by slides. A great exposition at San Francisco, to celebrate the completion of the canal, was opened on February 20, 1915, by President Wilson pressing a button at Washington and sending a message by wireless to the Tower of Jewels.

WHAT THIS STORY TELLS US

WE have learned already that the earth is round like a ball; we learn now that the great earth-ball is always spinning. If you could throw a ball into the air which would spin round and round like a top, and travel through space without ever stopping, the ball would be doing what the earth is always doing. Nothing seems so still as the earth on which we stand, but that is because it moves so smoothly. The earth is really moving faster than the fastest train; but we cannot tell that it is moving because it moves so quietly and smoothly, and everything moves with it. It is this movement that makes day and night. The sun does not rise nor set; it is the earth passing in and out of the sunlight that makes day light and night dark.

THE EARTH IS ALWAYS MOVING

CONTINUED FROM PAGE 7

THE first thing that we are inclined to say when we are told the earth moves is that we do not feel the earth moving, but the answer to that is easy.

When you are in a train in a station, you sometimes cannot tell whether the train is moving or not, except, perhaps, by looking at another train standing at the other platform, and sometimes you think your train is moving, until you see that the platform is quite still. It was the moving of the other train that made you think *your* train was moving. So it proves nothing to say that we do not feel the earth moving with us. If you are traveling in a train, or on a boat, or in a balloon, or on this great earth of ours, you have only two ways of judging whether you are moving or not. One is by feeling the movement under you, and the other by noticing that things outside seem to be moving past you.

Now, certainly we cannot feel the earth move under us, but this is simply because the movement is so smooth. When you are inside a very big boat, you cannot tell whether the boat is moving if the sea is smooth. If you shut your eyes in a balloon on a calm day you cannot tell that it is moving—often you cannot tell even if your eyes are open. When we feel that a car is moving under us, that is only because its movement is jerky. Every time the car moves a little more slowly, our bodies go on moving forward at the old rate and then are slowed up with a jerk; then when the car goes on a little faster, our bodies are left behind a little, and then are jerked forward. So we know that the car is taking us where we want to go.

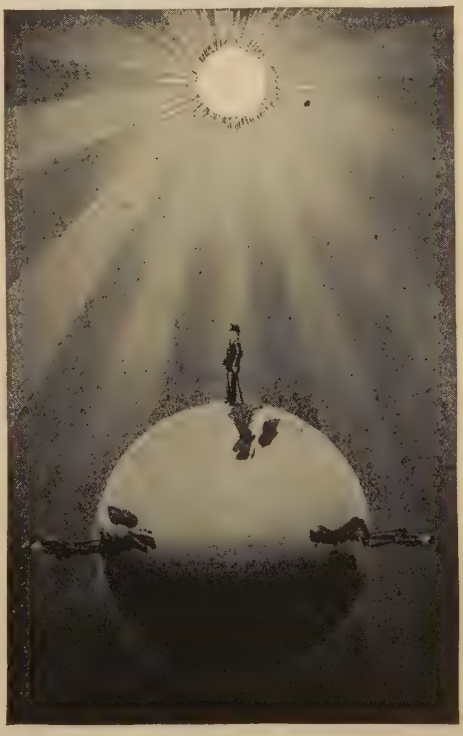
The more smoothly the car travels, the less can we feel its traveling. Now, of all the things that men can travel in, the balloon is said to be the smoothest, because when the air is quiet you cannot feel its motion at all. It is better than traveling in the best steamer, the newest electric train, or the finest motor-car. But really the smoothest thing to travel on is *the earth itself*, which we are all really traveling on all the time, no matter whether we are swimming or walking, or flying in a balloon. The best proof of the smoothness of the earth's motion is that no one has ever felt the earth moving. Sometimes a little bit of the outside of the earth moves by itself, and then people feel it. That is called an earthquake, and is quite different. No one has ever felt the movement of the earth as a whole.

What would happen if the earth suddenly stopped moving? If suddenly the earth *did* stop moving, as a car pulls up sharp, or as you pull your arm up sharp when you throw a ball, what would happen to us? When a car stops suddenly, all the passengers are jerked forwards. When you pull up your arm sharply to throw a ball, it is thrown forward ever so far. The

earth is going so fast that, if it were suddenly to stop moving, all the loose things and many of the fixed things on it would be thrown off into space. They would not travel very far, perhaps, because they soon would be stopped by the air, just as the air helps to stop a ball when you throw it. But we may be quite sure that, if the earth suddenly stopped moving, all men and women and children and animals would be killed, all the water would be splashed out of the sea, all the fishes would die, and every city and building would be destroyed. That is not likely to happen.

If you cannot *feel* that the thing you are traveling on is moving there is only one way of finding out that it is moving, and that is by looking at things outside, and seeing what they seem to do. Now, clever men have been doing this for ages and ages, and there seemed to be no doubt at all about what they saw. As we have already seen, when we look up at the sky we find the sun, for instance, seeming to travel once right round the earth every day. But just as a little boy in a railway train can make a mistake and can sometimes think that the other train is moving, when it is really *his* train that is moving, so all the men who thought they saw the sun moving across the sky were wrong. It was not the sun that was moving, but the earth. We still talk of the sun rising and setting, and no doubt men will go on doing so for ages, but the sun does not rise and set. It is simply the earth that is twisting round like a top. If you have not got a globe, a little round model of the round earth, you certainly should ask your father or mother to get you one. It is very nice to have a big one, as large as a giant snowball, but it is quite easy to get cheap little ones, no bigger than an orange, and it is wonderful how much you can learn from one of these with very little trouble. Now, if you have such a globe, you can easily learn from it something about the first kind of movement of the earth.

THE MEANING OF DAY AND NIGHT



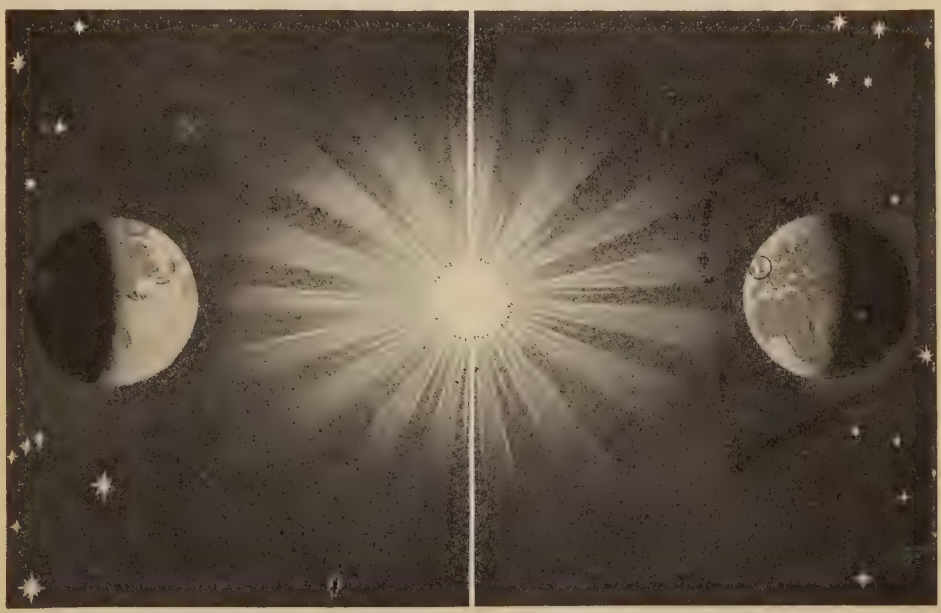
If we could look down upon the earth as if we were looking down on a spinning top, this is what a man would look like if he were big enough for us to see him. Suppose he stands in England at sunrise. To the right of the picture we see him entering the sunlight. As the earth spins round it carries him nearer the sun, until at midday the sun is over his head. At night we see him passing out of the sunlight, at sunset, and he is in darkness until morning brings him round into the light again. This is the meaning of day and night.

There are, at least, three different ways in which the earth is moving, and we must look at them all. The one we shall begin with explains why the sun seems to rise every morning in the east, and to set every evening in the west. Take your little globe—or, if you have not a globe, an india-rubber ball or an orange will do—and hold it in your hand opposite a lighted candle in a room where everything else is dark. The side of the ball next to the candle will be lit up, and the side away from the candle will be dark. Put a spot of ink on the ball, and call it your house, and hold the ball so that the spot of ink is opposite the candle. Now turn the ball slowly round, and as you do so the spot of ink will travel round until at last it loses the light of the candle. Then, as you go on turning, the spot of ink will at last become lit up again.

The candle stands for the sun, and when the spot of ink is just opposite the candle, that is *midday*. Then, as the ball—or the earth—goes on turning,

the spot of ink—or your house—loses the candle-light; that is to say, the sun sets, and it is night. Then the spot turns to the side where the ball is lit up, and if you were on that spot you would say the sun had risen.

Just think what it would be like if it were always day, or if it were always night. If the earth were not for ever spinning round and round like a top, and if it were quite still, one half of it would always be in daylight, whilst the other would have an endless night. no night at all. It would just go on being day-time. Do you think that all the people from the other side of the world, where it was night all the time, would jump into their ships and come over to our side so as to see the sun again? I am sure they would, but I am also very sure that before long we should all be very glad to get on to the dark side of the earth, for a time, at any rate. If we did not, I think we should all go mad. The best thing for us is that the earth should go on



THE EARTH ON A WINTER'S NIGHT IN ENGLAND THE EARTH ON A SUMMER'S DAY IN ENGLAND

This shows us why it is light by day and dark at night and also how the earth goes round the sun. In the right-hand picture of the earth it is midday in England, and that country, which has a ring round it in the picture to help you find it, is in the full light of the sun. The other half of the world is in darkness, and it is night there. The earth is always spinning, and as it spins round we pass out of the light, and our side of the earth is then dark and it is night. So the earth spins round, in the light and out of it. It also travels round the sun. It takes the earth half a year to travel half round the sun as seen here, and on its journey right round the sun it spins round 365 times, making 365 days and 365 nights, which we call a year.

So long as you hold your ball, or globe, or orange, still, one half of it must be next the candle, and the other half must be away from it. What do you think would happen if the earth stopped moving round and round, and if it slowed down quietly like a top so as not to jerk us all off? Suppose it stopped with our part facing the sun, we should say: "The sun is standing still in the heavens." The lamplighters would do their work at the ordinary time. People would say: "It is a very bright evening," and then they would say: "Whatever has happened?" There would be spinning as it spins now, and that we should have the day to be awake in and the night for sleep.

I have read a story of some bees that worked hard all day, and then, just after they had all gone to rest, someone lit a brilliant electric light, like those we see in the streets, and brought a sham day back to them. They started work again until the electric light was put out, and then, soon after, the sun rose, and they started again. At the end of that day they were all worn out, and died from overwork. But the natural and proper thing

for bees, and for men, too, who live on a great spinning top, is to be awake when the part of the top they are on is facing the sun, and to be asleep when it is turned the other way.

But the spinning of the earth, which gives us night and day, is by no means the earth's only movement. You will have noticed, when spinning a top, that sometimes it stands in one place and spins there, but sometimes, as it spins, it moves along the table. When this happens the top is moving in two ways at once. It is at the same time spinning on itself, so to speak, and also being moved as a whole from one place to another. The earth is like the top. All the time that the earth is spinning upon itself it is also moving as a whole, just as the top does when it moves along the table. We do not feel this, but it is the most important movement of the earth, even though its results are not so startling as the day and night which the spinning movement gives us.

THE GREAT FACT IN NATURE THAT MAKES A YEAR A REAL THING

There is no need now to ask what holds the earth "up." We know that the earth is not supported by anything, but flies through space without stopping from one year's end to another.

Now, I have purposely said "from one year's end to another," because this movement of the earth explains one year's end and another. A year, you know, is a real thing — not like a week. You think a week is a real thing because Sunday always comes back every seven days, and so do the other days. But we might just as well miss out Wednesday, Thursday, Friday, and Saturday, and make the week three days only. Long ago men agreed to call seven days a week, and we do so still. But a week is an *artificial* thing; a day is a *natural* thing, and so is a *year*. We say a week is an artificial thing because nothing in Nature makes it; but a day is a natural thing because a great fact in Nature makes it, that fact being the spinning of the earth. A year is also a natural thing because it is made by this second kind of movement of the earth, like the movement of the top *along* the table.

Let us think of a spinning ball now, instead of a spinning top. You know very well that a ball can spin as it goes along, because you can set it spinning on a table, and as it spins it will also run in one direction or another. What direction does the earth move in, then? We have already seen that day and night, which never fail us, are due to its spinning. Now, on the whole, one night is just about as dark as another, and one day as bright as another — that is, if we think of all the days and nights we can remember.

THE EARTH IS ALWAYS FLYING ROUND THE SUN

This means that the earth does not get much nearer to the sun or go much further from it. It stays at just about the same distance, and yet it always goes moving onwards, onwards, onwards. That means that it *must* go *round the sun*. If you tie a string from your ball to your candlestick you could make the ball fly round the candle, only it would not be so easy to make the ball spin as it flew. If you could make it spin, and if you could make it spin on itself just about 365 times whilst it was going right round the candle once, that would be like what the earth is doing. The earth is always flying round the sun, and if you made a mark, so to speak, at some point, and then waited until the earth came back to that point after going round the sun once, the time the earth took in its journey would be a year, and during that journey round the sun the earth would have spun round on itself 365 times. Really, it is about 365 and a quarter times, and it is that we may not forget that quarter that every four years we have what we call leap year, making the year 366 days long by giving February 29 days instead of 28.

A GREAT MISTAKE THAT MILLIONS OF MEN HAVE BELIEVED

Now, this is very far from being all that there is to say about the year, and we shall come back to it. But at present, you remember, we are just trying to see the great facts which men had to discover before they could get any further with the story of the earth. These facts are that the earth is not flat, but a ball. It is not at rest, but never ceases moving. It spins round on itself, making day and night, and in doing so it has led millions of men to think that the sun goes round the earth every day. Also, this spinning earth travels right round the sun once a year.

THE NEXT STORY OF THE EARTH IS ON PAGE 141.

THE TALES OF LONG AGO

WE turn to this part of our book for our stories, the great stories that we all love to hear. And what wonderful tales they are—tales of fairies, and giants, and ogres, and goblins, and castles, and mysteries which no wise man could ever understand. We shall read them here together. We shall meet here friends and enemies. Brave Jack the Giant Killer, beautiful Little Red Riding Hood, sad little Cinderella—all these and a whole host of wonderful people come into this part of our book. Who wrote these tales we do not know; but we know that since the world began boys and girls in every country have sat by the fire listening to the tales which never make us tired, and we know, too, that children will sit listening to them patiently as long as the world lasts.

Aladdin and the Wonderful Lamp

ONCE upon a time an African magician came to China to find a wonderful lamp.

In order to get it he had to crawl through a passage leading to a fairy palace beneath the earth. The passage was very small, and anyone who let his dress touch the walls was killed by magic. The magician did not like to risk his own life, so he made friends with a little Chinese boy, called Aladdin, and took him to the fairy palace.

"In this place," said the magician, "a treasure is hidden. Do what I tell you and you will become the richest man on earth. Keep this ring on your finger, and do not let your clothes touch anything until you have put out the little lamp that burns in the garden, and placed it in your pocket. Then you can take away as much treasure as you wish."

Down jumped Aladdin into the passage leading to the palace. He found the lamp in a garden where diamonds and pearls and rubies grew upon the trees. Putting it under his vest, he filled his pockets with jewels and returned to the passage.

"Give me the lamp, and then I will help you out," said the magician.

"No," said Aladdin; "help me out and then I will give you the lamp."

This made the magician very angry, and he closed up the opening in the earth, and went back to Africa.

For two days Aladdin wandered about the fairy palace without finding anything to eat, or any way of escape. On the third day he happened to rub the ring which the magician had put on his finger. A spirit then appeared before him, and said:

"I am the slave of the ring. What do you wish me to do?"

"Please take me home," said Aladdin.

In the twinkling of an eye he found himself outside his mother's house. She was a poor widow, and had nothing for him to eat and no money to buy him anything. So he gave her the wonderful lamp, and asked her to sell it and get some bread.

"It is very dirty," she said, giving it a rub.

A spirit then appeared, and said:

"I am the slave of the lamp. What do you wish me to do?"

The widow was too frightened to reply, but Aladdin boldly said:

"Please bring us something nice to eat."

In the twinkling of an eye a table appeared on which there were all kinds of meat and wine, in dishes of gold and goblets of crystal.

Having dined in this manner, Aladdin went out for a walk, just as the daughter of the King was riding by. Princess Badroulboudour, as she was called, was a lovely girl, and Aladdin fell in love with her. He went indoors and rubbed the wonderful lamp, and said to the spirit:

"Please make me rich and build me the finest mansion in the world."

In the twinkling of an eye Aladdin and his mother found themselves in a palace of gold, with six hundred servants to wait upon them, and wealth enough to buy a kingdom. They sent forty basins of gold filled with diamonds

and pearls and rubies to the King, and he was so pleased with the gift that he allowed Aladdin to marry Princess Badroulboudour. Aladdin and his wife lived together in peace in the palace of gold until the African magician came again to try and get the wonderful lamp. He found that Aladdin was away hunting, and, disguising himself as a hawker, he walked around the palace shouting:

"New lamps for old! Who will change new lamps for old?"

"I will," said the Princess, running out into the courtyard.

The Princess remembered that there was a little dirty lamp in Aladdin's room, and she brought it out, and, in exchange for a large, bright, new one, gave it to the magician. It was the wonderful lamp! So the magician at once rubbed it, and commanded the spirit to carry the palace of gold and everything in it to the farthest part of Africa.

"Am I dreaming?" said Aladdin, when he came back from hunting. Where his palace had stood there was only a patch of bare ground. Happily, he still wore the ring which the magician had placed on his finger, and he now happened to rub it again.

"What do you wish me to do?" said the slave of the ring.

"Please bring back my wife and my palace," said Aladdin.

"Only the slave of the lamp can do that," replied the spirit.

"Well, take me to Princess Badroulboudour," said Aladdin.

And in the twinkling of an eye he found himself sitting beside his wife at a dinner-table in his palace in the farthest part of Africa. They were overjoyed to see one another, but before they were able to escape the magician came upstairs to dine with the Princess. Aladdin quickly crept under the table, and placed a powder in his wife's hand, which she put in her glass of wine.

"Here is an excellent wine," she said to the magician; "just taste it."

The bad magician drank the wine eagerly, and down he dropped, dead.

Aladdin rushed out, found the lamp in the magician's pocket, and rubbed it.

"Oh, please," he said to the spirit, "take the palace back to the place from which it was removed!"

Immediately the palace was taken up from the spot on which it stood in Africa, and set down in China, opposite the palace of the King, who gave them all his riches and made them his heirs.

The magician sat at dinner with the Princess, and the Princess put a powder into her wine. "Here is an excellent wine," she said; "just taste it." The bad magician drank eagerly, and dropped down dead.

THE STORY OF THE DAYS

SUNDAY; MONDAY; TUESDAY; WEDNESDAY; THURSDAY; FRIDAY; SATURDAY

HAVE you ever met Mr. and Mrs. Day? A more useful family you will never meet from one year's end to the other. They are, in fact, the best servants of the human race, and do as much work in their time as anything or anybody on the face of the earth. We must make their acquaintance.

The seven-roomed house in which they live is called "The Week," and it stands in Month Street, which is one of the twelve roads running through Year Town in the wonderful country of Time. We will enter this house and go through the seven rooms together. Mr. Day lives in one room, Mrs. Day in another, and their five children have each a room to themselves. But they are only separated from each other by walls of Sleep, and they talk to each other through the telephone of Dreams.

Now, this is the first room, occupied by Mr. Day, who does less work than the rest of the family, but who is very far from being idle. He puts on a surplice and holds Church services, and he also has to provide the whole of the human race with amusements and recreations. He is the father of the family, and he is known by the name of Sun Day.

"Hullo, Mr. Sun Day! How are you? Glad to see you. But everybody's that, eh? There is no other member of your family quite so popular as you are! Come, I hope you are glad to see me, too. I've brought a little friend with me, who wants to know how you got your name, and to hear something of your history. Do you feel like talking for a few moments?"

"How I got my name? Well, that is a very old story. How I got my bad name isn't nearly so old; and how I am getting my good name is quite a new story. Nevertheless, just to oblige your young friend, I'll run the whole three stories into one, and begin with the old one. Far back in the history of the world, my boy, people could see nothing so wonderful, nothing so beautiful, and nothing so useful as the sun. They had in them what is called the *instinct of worship*—that is to say, they had a feeling that there was Something greater, stronger, and more glorious than themselves—Something that they ought to

AGES AGO MEN WORSHIPPED THE SUN AND CALLED THE FIRST DAY OF THE WEEK AFTER HIM

fear, reverence, and worship. The sun seemed to these first people the token or sign of that Something, and they worshipped it. The sun, in fact, became the visible expression of God. Now, when the world got wiser, and men and women knew more about the true God, they still kept the old idea of the heathen in their heads, and called the Christian Sabbath—which means the day of rest—Sunday. They no longer worshipped the sun, but they called the first day of the week after him, and that is how I got my name.

"People loved me then, and I gave rest, and pleasure, and festivity to hundreds of generations. Well, as time passed on, people began to make me anything but a sun-day; they made me a black day. Children were not allowed to play; books and games were put away and locked up in cupboards as something wicked; and all my precious hours were spent in gloom and solemnity.

"Then it was that I got a thoroughly bad name. People said Sunday was the gloomiest day in the week; they ate too much, and set about yawning and grumbling. Just lately I've reminded them that the Founder of Religion once said: The Sabbath was made for man, not man for the Sabbath. They don't quite understand just yet what that means. Some of them are noisy and wild and foolish on the Sabbath; they have gone to the other extreme. But it will come right soon. People will use me for rest of body and mind in a proper way, and my good name will be restored.

"Well, let us pass to the next room and see what Mrs. Day will tell us."

"I've no time to stay to gossip. I'm a busy woman. Everybody knows that I'm the busiest Day in the week. It's coming after Sunday that does it. Ah, my husband is a lazy fellow! The mess I have to clear up after him! I don't believe in holidays. Let everyone do his work."

MONDAY WAS SACRED TO THE MOON, THE WIFE OF THE SUN, WHO WALKED IN THE WOODS

"We mustn't interrupt her," said Mr. Day. "Her name of Mon is short for Moon. She is really Moon Day, the day sacred to the wife of the Sun. In ancient times people called the goddess of the moon Diana, and temples were built for her in nearly every quarter of the world. They used to think that Phœbus Apollo, the Sun God, drove his flaming chariot across the sky by day, and that Diana drove her silver chariot through the sky by night. They loved Diana because she was gentle and beautiful. Woods were sacred to her because she could be seen walking through them. Round cakes were made

TYR, THE GOD OF WAR, CAPTURED THE WOLF-SPIRIT, AND TUESDAY IS NAMED AFTER HIM

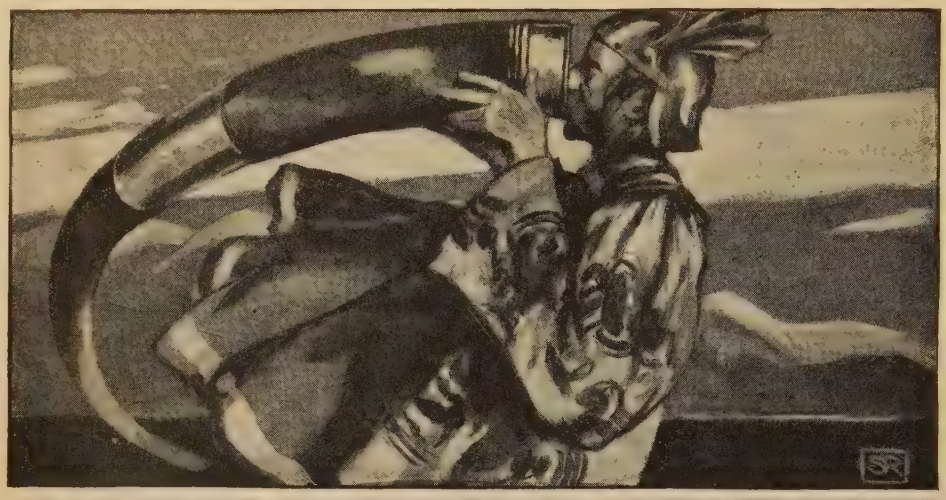
on her feast day, with candles stuck round them. Boys and girls considered Diana their own particular goddess, and loved her very much."

And now we must peep into the room of Mr. and Mrs. Day's eldest son, Master Tues Day. You observe that he has only one hand, and the story of how he lost his other hand is the story of how he came by his name.

The Norsemen had a god of war named Tyr, and when a terrible wolf-spirit, named Fenris, had to be captured, because he was troubling the whole earth, it was Tyr who undertook the dangerous venture. The spirits of the mountains had made a chain out of the hardest things in the world to find—the footsteps of a cat, the beards of women, the roots of stones, the breath of fishes, the nerves of bears, and the spittle of birds. This strange chain could not be broken, and with it Fenris was to be bound.

But Fenris would not allow even this soft-looking chain to be put round his neck, and said he would only suffer it if the gods would promise to take it off again, and would send a god to put his hand in the wolf's mouth. Tyr was the only god brave enough to volunteer. He put his hand in the mouth of Fenris, and Fenris was bound; then, in his rage at being captured, he bit off the hand of the god. It is curious that the French name for Tuesday is Mardi—that is the day of Mars, who was also a god of war like the Norseman's Tyr, who gives us Tyr's Day, or Tuesday. The second

WEDNESDAY IS CALLED AFTER WODEN, WHO SENT RAVENS ROUND THE WORLD FOR NEWS



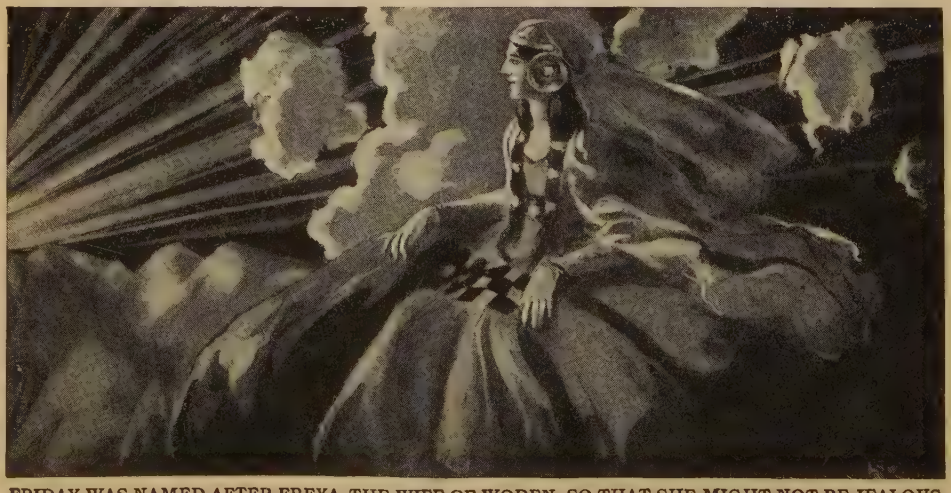
THE MORE THAT THOR, THE GOD OF THURSDAY, TRIED TO DRAIN THE HORN, THE MORE IT FILLED

son of Mr. and Mrs. Day is named after Woden, or Odin, the greatest god of the Scandinavians. Woden lived in a palace built entirely of gold and silver, which was called Valhalla. Two ravens stood on his shoulders, and when he wanted news of the world he sent these ravens to fly round the earth and bring him intelligence of everything they saw and heard.

Round about him stood maidens with helmets, and spears and shields, and these maidens, named Valkyries, were sent down to earth to bring the souls of heroes slain in battle to feast with Woden in Valhalla. While they feasted, Woden listened to their stories and drank mead. He never ate anything himself. Our friend Wednes Day is a good fellow, and everybody likes him. He lives in the middle of the house, and seems to be saying all day long:

"Work away; work away! Sunday will soon be here again."

And now here we are at the fifth room, occupied by Master Thurs Day. Isn't he a big, strong, vigorous fellow? If ever you have a hard bit of work to do, start at it on Thursday—the day of strength and power. Thurs Day gets his name from Thor, the strongest of all the Scandinavian gods. Thor had a hammer which no man could lift, a pair of iron gloves, and a belt which, when it was fastened round him, doubled his great strength. But once the mighty hammer was lost, and a giant named Thrym hid it. He said he would only



FRIDAY WAS NAMED AFTER FREYA, THE WIFE OF WODEN, SO THAT SHE MIGHT NOT BE JEALOUS

give it up if the goddess Freya would marry him. Thor disguised himself in Freya's dress and went to visit the giant. Imagine the Giant's surprize when he saw the lovely goddess eat a whole ox and eight salmon at a single sitting! The companion of Thor explained that the long journey had made the goddess hungry. Thor received the hammer, and slew Thrym and all the other giants. But there were some things beyond even his power. He tried to

female Day got her name is rather sad. Woden was Freya's husband, Thor her son; and it was only because she might be jealous that our ancestors named a day after her when they had given one to Woden and one to Thor. However, Friday is a very sacred day, although some superstitious people think it is a day of ill-luck.

And now we come to the half-holiday room, where Satur Day lives, who gets his name from the Roman god Saturn.

SATURDAY IS THE DAY OF SATURN, IN WHOSE HONOR THE ROMANS USED TO FEAST AND DRINK

lift a cat, and was surprized to find that he was unable to; the reason was that the cat was really the serpent Midgard, who holds the earth in its embrace. He then tried to drain a horn dry, but he found that the more he drank the more it filled; this was because the other end of the horn was fastened to the sea, and, as we all know, the sea could never be drained.

The sixth room belongs to Mr. and Mrs. Day's only daughter, Fri Day, named after the goddess Frigga, who is not the same as Freya. How this

The Romans used to feast and drink and make merry in honor of Saturn. Saturn was a god who ate his own children and behaved altogether in a very barbarous fashion. We won't speak too much about him. For us Saturday is one of the pleasantest days in the week. The week's work is done, in fact it is almost a national half-holiday, and people go in crowds to see a ball game, or pour out of the cities in thousands to see and enjoy the fields and woods, or, if they happen to be near the sea, to wander by the shore.

CONTINUED ON PAGE 201

MAKING A BASKET OUT OF WILLOWS

Millions of baskets are made every year to pack for market the fruit that grows in the orchards. Most of these are made from osiers, the long thin willows that grow in wet and marshy ground. Here we see osiers growing, and on the right are bundles of osiers cut and heaped up in the water to soak.

The osiers are then ready for use. Some are used just as they are, but most of them have the bark stripped off. This is done by pulling the osier through two iron edges as seen here, where the stripped bark is hanging down.

After the stripped osiers have been laid out to dry, the thin are separated from the thicker and stronger ones. The worker begins by making a bottom with the stronger osiers, which he knits together. The next thing he does is to fix to the bottom a number of upright willows.

The thinner willows are plaited in and out of the upright ones, being worked round and round until the sides are built up to the proper height. The ends of the upright willows are then bent down into the basket to make it stronger, and a border is worked around the top.

Baskets were made in this way in England before Jesus Christ was born, and the ancient Britons were very clever at this work. When the Romans went to Britain they learned to make baskets, and began basket-making in Rome on their return. The baskets in these pictures are made in a Kentish village, close to where the ancient Britons made their last stand against the Romans, and where the Romans no doubt found basket-makers at work 2,000 years ago. 60,000 baskets are made in this village every year.

CAN A TRAIN RUN ON ONE RAIL?

CONTINUED FROM 49

IT is, of course, impossible for an ordinary train to run on one rail, because the wheels are placed in pairs, some being on each side of the carriage, therefore they must have a pair if rails to run upon. But it would be a different matter of the wheels were placed in front of each other underneath the middle of the carriages, so that there was but a single row.

THE GYROSCOPE

The wheels of such a train would, of course, run upon a single rail, and the train would have to be, somehow or other, balanced on this one rail, so as not to fall. Of course, we can understand that it might be balanced while moving, just as a bicycle is, but that would not do for a train, which must remain balanced when moving slowly and when standing still.

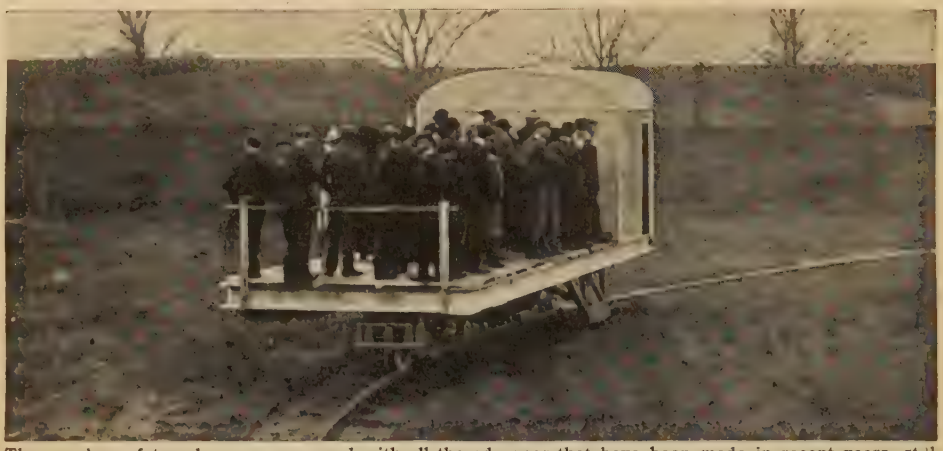
It is quite possible to make a train to run on a single central rail, and it can be balanced by having the rail pushed up, so to speak, right into its centre. Then the train hangs down on each side of the rail, as we see in the top picture on page 99. It is a very great advantage to the speed of the train to be built in this way, for the number of wheels is halved, and that means halving the friction, which largely helps to retard the train. Thus very great speeds can be attained, such as one hundred and twenty or a hundred and thirty miles an hour. There are other ways, also, in which moving things may be balanced on a single rail, and we may be quite accustomed to such things in the not very distant future, for an Irishman, Mr. Louis Brennan, has shown us how to use the gyroscope, that top which we all know so well, for this purpose.

THE PRINCIPLE OF THE GYROSCOPE

The principle of the gyroscope can be understood by watching *any* top balance itself on its point when revolving at high speed; but a gyroscope top has been invented which shows it still more clearly. This consists of a metal disc supported on a pivot within a cage in such a way that if the disc is set spinning, the cage can be placed on any kind of surface, even a wire, pencil, or pin point, and will remain perfectly balanced as long as the disc inside revolves at high speed.

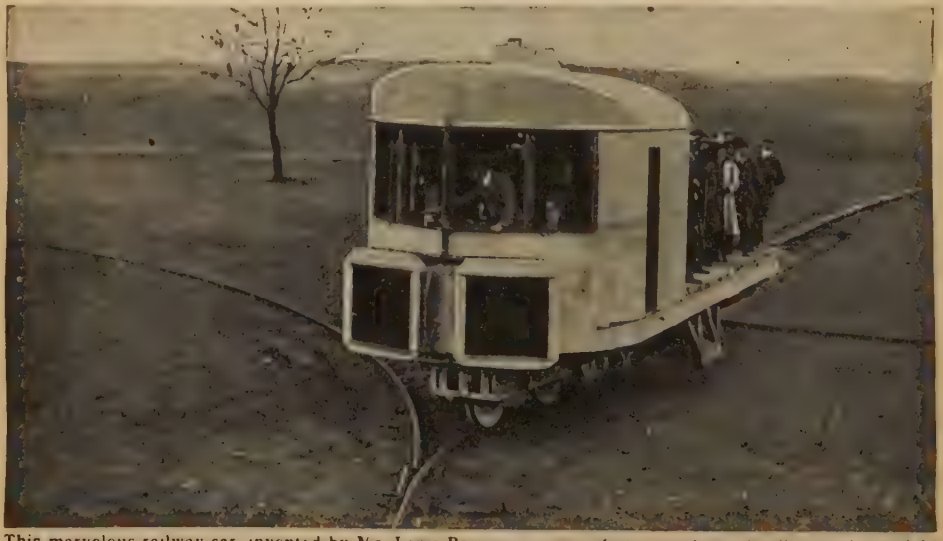
From this you can see how two big gyroscopes, having heavy fly wheels of several tons weight, and revolving several thousand times a minute in opposite directions, within cages which are properly fastened to a car, would easily balance this car on a single rail.

A TRAIN THAT RUNS ON A SINGLE RAIL



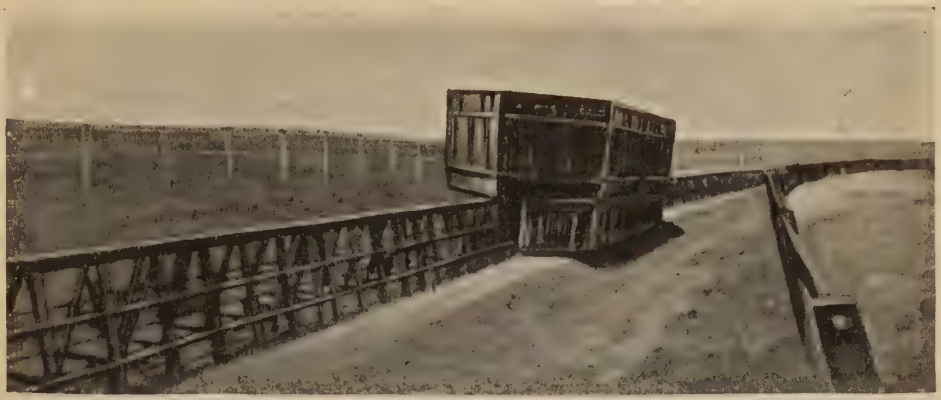
The wonders of travel never cease, and with all the advances that have been made in recent years, still greater marvels are in store for us. It is probable that before long we shall be able to travel at a speed of 150 to 200 miles an hour, in a train that will run on a mono-rail — that is, a single rail instead of a pair of lines. Here we see a mono-rail car, recently invented, which is the most wonderful vehicle ever made.

This picture shows us the principle of the mono-rail car, which is called a gyro-car, because it is fitted with two gyroscopes, A and B, like those toy tops that spin in all positions. The centrifugal force of the whirling tops counteracts the pull of gravity, and the car, even when still, will remain upright on one rail.



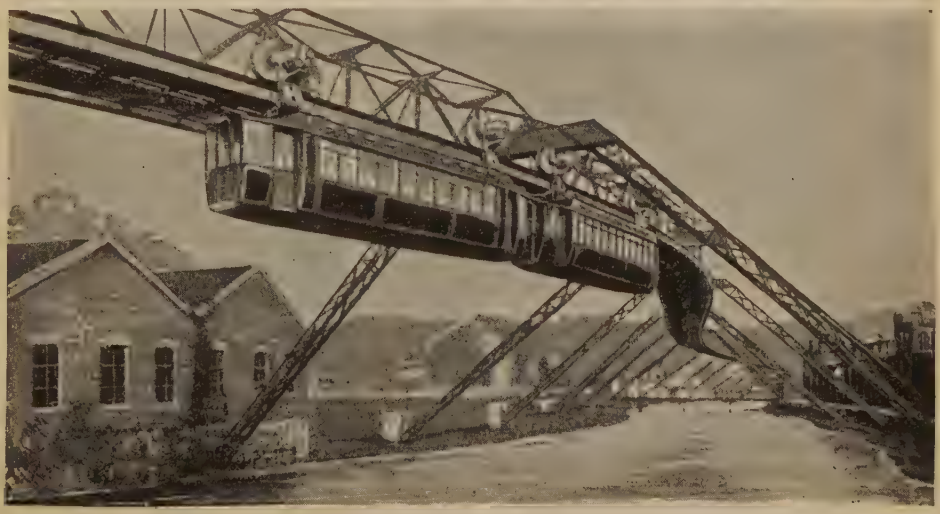
This marvelous railway car, invented by Mr. Louis Brennan, carries forty people, and will remain upright and steady on a single rail, whether it be traveling or standing still. The gyroscopes that keep it upright make 3,000 revolutions a minute, and will go on spinning for two days after the driving power is cut off.

HOW SOME PEOPLE GO BY TRAIN



While the gyro-car is a new invention that has yet to be brought into practical use, there are several railways actually working in which only a single rail is used. One of these is at Ballybunnion, in Ireland, where a speed of 83 miles an hour is reached. Another is being made between Manchester and Liverpool, and the journey of 34 miles is to be made in 20 minutes. This picture shows a mono-railway at Brussels.

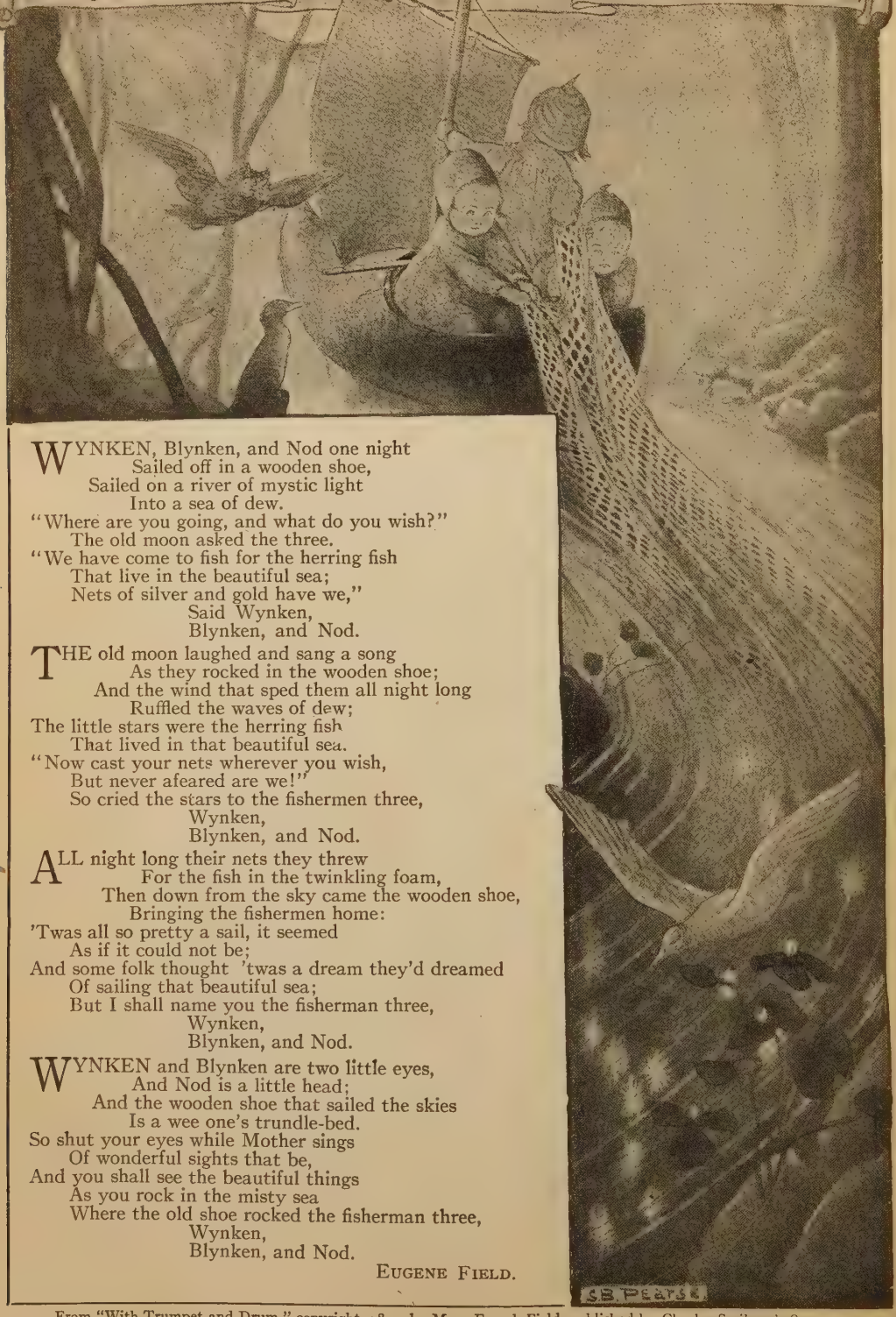
Another kind of mono-rail is known as the Kearney system, in which a guiding rail is suspended by iron supports above the train, and pairs of wheels, placed at intervals on the car, grip this rail, and thus steady the car. In one sense this is a mono-rail system, but the upper rail almost constitutes a double line.



Another mono-rail track is the Wupper Valley Railway, running from Elberfeld to Barmen, in Prussia. The trains are suspended from a single rail supported on iron girders. The railway is more than eight miles long, and for a considerable part of the course the railway hangs over the River Wupper. Each car carries fifty passengers, and with its load weighs about 14 tons. This railway has proved a great success.

CONTINUED ON PAGE 163

Wynken Blynken and Nod



WYNKEN, Blynken, and Nod one night
Sailed off in a wooden shoe,
Sailed on a river of mystic light
Into a sea of dew.
"Where are you going, and what do you wish?"
The old moon asked the three.
"We have come to fish for the herring fish
That live in the beautiful sea;
Nets of silver and gold have we,"
Said Wynken,
Blynken, and Nod.

THE old moon laughed and sang a song
As they rocked in the wooden shoe;
And the wind that sped them all night long
Ruffled the waves of dew;
The little stars were the herring fish
That lived in that beautiful sea.
"Now cast your nets wherever you wish,
But never afeared are we!"
So cried the stars to the fishermen three,
Wynken,
Blynken, and Nod.

ALL night long their nets they threw
For the fish in the twinkling foam,
Then down from the sky came the wooden shoe,
Bringing the fishermen home:
'Twas all so pretty a sail, it seemed
As if it could not be;
And some folk thought 'twas a dream they'd dreamed
Of sailing that beautiful sea;
But I shall name you the fisherman three,
Wynken,
Blynken, and Nod.

WYNKEN and Blynken are two little eyes,
And Nod is a little head;
And the wooden shoe that sailed the skies
Is a wee one's trundle-bed.
So shut your eyes while Mother sings
Of wonderful sights that be,
And you shall see the beautiful things
As you rock in the misty sea
Where the old shoe rocked the fisherman three,
Wynken,
Blynken, and Nod.

EUGENE FIELD.

From "With Trumpet and Drum," copyright, 1892, by Mary French Field, published by Charles Scribner's Sons.

THE WORLD'S GREAT POEMS

IT is a splendid thing to be able to say something which the world will never forget, and many books that will never die have been made up by fine words spoken and written by great men and great women. Most of these never-to-be-forgotten words are in poems, because poems are much more easy to remember than ordinary reading, which we call prose. There are thousands of beautiful poems that everybody ought to read, and nobody who does not read them can really know how fine a thing reading is. True poetry is more precious than gold. It helps to make us good, and happy, and hopeful, and it is so pleasant to read that the words sound like music. We shall find in this part of our book some of the best of all these poems, which will make us anxious to read more and more poetry as time goes on.

POETRY THE MUSIC OF WORDS

By J. A. HAMMERTON

THERE are two ways of writing a story, or telling about a place or a thing or an event. The one way is to write it down in words like those we use in speaking one to another, but using the words more carefully, so that they will give as good an idea of what we have seen or thought as words can give. This kind of writing is called Prose. The words and sentences used by great writers are so well chosen and arranged that they give us a clear idea of what has been in the writer's mind, and in reading them aloud we find that they have a fine and pleasing sound.

But there is another kind of writing in which the words and sentences used by the writers sound far sweeter and more musical than the words of prose. This we call Poetry, and those who write it are called Poets.

Prose is used to tell almost any kind of story, or to describe anything; but there are grand things in history, beautiful scenes in the world, noble thoughts in the minds of men, that can be better described in poetry.

Poetry began, very likely, with the desire for singing, which comes when we are very happy or after a success of any kind. Long ages ago, when our far-off forefathers could not even read or write, they had poets who went with them into battle, and after the victory these poets, or bards, as they were called, would compose verses of fine-sounding words to celebrate the victory. These verses they sang while they played a harp. In this way poetry began, perhaps, men having their minds full of happy thoughts, and finding that they could best utter these thoughts by choosing words of musical sound. Homer, one of the greatest of poets, was a blind Greek who lived more than eight hundred years before Christ. He used to recite in public places in Greece his poetical descriptions of the wars of the Greeks.

There are three kinds of poetry. There is Dramatic Poetry, which is written in the form of people speaking to each other, as in the plays of Shakespeare. Then there is Epic Poetry, which is usually a description of some great event, a hero, or the history of a nation, told in grand, noble words. The third kind is called Lyric Poetry, from the fact that it was originally intended to be sung to the playing of a lyre, which is a very ancient musical instrument somewhat like a harp. All beautiful songs come into lyric poetry.

Another thing to know is that poetry is written sometimes in rhymed lines and sometimes without rhymes. A rhyme means that similar sounds occur at the ends of lines, though the words are different. Here is one, with the sound that makes the rhyme printed in different type:

The world is so full of a number of th*ings*,
I'm sure we should all be as happy as k*ings*.

If you count the syllables in these two lines you will find that both have

eleven. There should always be a certain number of syllables in a line of poetry, but the number will depend on the plan the poet has arranged. Your ear should always tell you when there are too many or too few.

How the poets make their rhymes

The words in which the same sounds occur need not be in following lines, but can be placed in all sorts of different ways. The rhymes in the verse below are alternate, which means that each line ends with the same sound as the next line but one after it:

Arabia's desert-*ranger*
To Him shall bow the knEE,
The Ethiopian st*ranger*
His glory come to sEE.

And here is another form of verse, in a tiny poem by Robert Louis Stevenson, in which half of the lines rhyme, while the other half have no rhymes:

The rain is raining all around,
It falls on field and tr*ee*,
It rains on the umbrellas here,
And on the ships at s*ea*.

The only advantage of rhyme is that it pleases the ear and helps us to remember all the words of the poem, but it does not make poetry, and much of our finest poetry has no rhymes in it.

When a poem has no rhymes it is called Blank Verse, and most of Shakespeare's works, and Milton's also, were written in this kind of verse; full of grand-sounding words and of lines that would have been far less noble and dignified if every two of them had ended with similar sounds.

Poems that do not need rhymes

For this reason nearly all poems about great events, tragedies, the deeds of noble men and women, are written in blank verse, which is more suited to those stories than lyric verse. Here is an example of blank verse from Shakespeare's description of Brutus:

His life was gentle; and the elements
So mix'd in him, that Nature might stand up,
And say to all the world, This was a man!

How fine these lines sound! They have the solemn music of a grand organ and need no rhyme; but each line must balance with the other in syllables and accent. Lyric poetry, in which the lines usually rhyme with each other, is oftenest used to describe the lighter and happy side of life, and in the BOOK OF POETRY it will nearly always be the happy side of life we shall hear about from the poets.

English poetry has a very long history, and was first written by men when our language was so different from what it is to-day that it looks almost like a foreign tongue when we see it printed now. But we will not go so far back to seek for poems among the works of the old writers. The first really great poet who lived in England was Geoffrey Chaucer, and no boy or girl could read the poems which he wrote unless they were turned into modern English. Even then they are not very well suited to young readers, and for this reason we shall take very little, if anything from Chaucer, who died more than five centuries ago. After his death, for many years there was not much good poetry written in England, and his is the one really great name that stands out among the poets of what we call the Middle Ages.

Greatest of all the poets in the world, William Shakespeare

The English language in those far-off days was going through many changes; and it was just about the time when Queen Elizabeth began to reign that it had become one of the finest languages in the world in which to write either prose or poetry.

Our language has not changed very greatly since the days of Elizabeth, so that William Shakespeare, the wonderful poet who was born in her reign and became the greatest poet of his age, and the greatest ever born in England, used very much the same language as Tennyson, who lived just before your time, nearly three hundred years later. For this reason Shakespeare is to be thought of as a writer of what we call Modern English, and in his poems we shall find that our language is used in the most beautiful way.

We might begin our readings in the wonderful book of English poetry with a number of poems and passages from Shakespeare; but perhaps young readers will prefer to have different poems from different poets in each part, and thus to become acquainted with many as soon as possible. So like bees in a rich garden, we shall go from flower to flower gathering our honey as we choose.

*MY SHADOW

We often have fancies that come to our minds at odd times, but only the poet can lay hold of these fancies and keep them for the delight of all who may read. "My Shadow" is an example of this. We must all, in our young days, have had some such thoughts, but only Robert Louis Stevenson, who wrote this pretty poem, was clever enough to turn these thoughts into words that can live.

I HAVE a little shadow that goes in and out with me,
And what can be the use of him is more than I can see.
He is very, very like me from the heels up to the head;
And I see him jump before me when I jump into my bed.

The funniest thing about him is the way he likes to grow—
Not at all like proper children, which is always very slow;
For he sometimes shoots up taller, like an indiarubber ball,
And he sometimes gets so little that there's none of him at all.

He hasn't got a notion of how children ought to play,
And can only make a fool of me in every sort of way.
He stays so close beside me, he's a coward, you can see;
I'd think shame to stick to nursie as that shadow sticks to me.

One morning, very early, before the sun was up,
I rose and found the shining dew on every buttercup;
But my lazy little shadow, like an arrant sleepy-head,
Had stayed at home behind me, and was fast asleep in bed.

*ARMIES IN THE FIRE

Looking into the fire at night when all is still and only the burning coals sputter and crackle, what strange pictures we seem to see! Did you ever see an army marching in the fire? That is what R. L. Stevenson once fancied he saw, and in this poem he paints his fancy over again in words. This poem, like "My Shadow," and other of Stevenson's verses which we shall print, is taken, by permission of Messrs. Longmans, Green & Co., from "A Child's Garden of Verses."

THE lamps now glitter down the street;
Faintly sound the falling feet;
And the blue even slowly falls
About the garden trees and walls.

Now in the falling of the gloom
The red fire paints the empty room;
And warmly on the roof it looks,
And flickers on the backs of books.

Armies march by tower and spire
Of cities blazing in the fire—
Till, as I gaze with staring eyes,
The armies fade, the lustre dies.

Then once again the glow returns;
Again the phantom city burns;
And down the red-hot valley, lo!
The phantom armies marching go.

Blinking embers, tell me true,
Where are those armies marching to,
And what the burning city is
That crumbles in your furnaces.

*From "Poems and Ballads," copyright, 1895, 1896, by Charles Scribner's Sons.

THE BROOK

This is one of the most beautiful of all Alfred Tennyson's poems. We fancy we can hear the brook speaking as we read these verses, and if you will sit beside a brook and read them you will come to feel something of the music and poetry of Nature, and the sound of the running brook will seem, in your ears, a song of joy. It is a poem of natural joy, and was written as part of a longer poem, but is complete in itself.

I COME from haunts of coot and hern,
I make a sudden sally,
And sparkle out among the fern,
To bicker down a valley.

By thirty hills I hurry down,
Or slip between the ridges,
By twenty thorps, a little town,
And half a hundred bridges.

Till last by Philip's farm I flow
To join the brimming river,
For men may come and men may go,
But I go on for ever.

I chatter over stony ways,
In little sharps and trebles,
I bubble into eddying bays,
I babble on the pebbles.

With many a curve my banks I fret
By many a field and fallow,
And many a fairy foreland set
With willow-weed and mallow.

I chatter, chatter, as I flow
To join the brimming river,
For men may come and men may go,
But I go on for ever.

I wind about, and in and out,
With here a blossom sailing,
And here and there a lusty trout,
And here and there a grayling,

And here and there a foamy flake
Upon me, as I travel
With many a silvery waterbreak
Above the golden gravel,

And draw them all along, and flow
To join the brimming river,
For men may come and men may go,
But I go on for ever.

I steal by lawns and grassy plots,
I slide by hazel covers;
I move the sweet forget-me-nots
That grow for happy lovers.

I slip, I slide, I gloom, I glance,
Among my skimming swallows;
I make the netted sunbeam dance
Against my sandy shallows.

I murmur under moon and stars
In brambly wildernesses;
I linger by my shingly bars;
I loiter by my cresses;

And out again I curve and flow
To join the brimming river,
For men may come and men may go,
But I go on for ever.

THE ENCHANTED SHIRT

This poem by John Hay, an American author and statesman, tells of a discontented, ill-tempered king, whose wisest doctor said he could only get well by sleeping one night in the shirt of a happy man. Couriers were sent to hunt throughout his kingdom for a happy man, but the only man who was happy was so poor that he had no shirt at all. Thus was the rich, discontented king made to feel shame, and to realize that a contented mind is far better than great possessions.

THE King was sick. His cheek was red,
And his eye was clear and bright;
He ate and drank with a kingly zest,
And peacefully snored at night.

But he said he was sick, and a king should know,
And doctors came by the score;
They did not cure him. He cut off their heads,
And sent to the schools for more.

At last two famous doctors came,
And one was as poor as a rat;
He had passed his life in studious toil,
And never found time to grow fat.

The other had never looked in a book;
His patients gave him no trouble;
If they recovered they paid him well,
If they died their heirs paid double.

Together they looked at the royal tongue,
As the King on his couch reclined;
In succession they thumped his august chest,
But no trace of disease could find.

The old sage said, "You're as sound as a nut."
"Hang him up!" roared the King, in a gale—
In a ten-knot gale of royal rage.
The other leech grew a shade pale.

But he pensively rubbed his sagacious nose,
And thus his prescription ran—
The King will be well if he sleeps one night
In the shirt of a Happy Man.

. . . . . .

Wide o'er the realm the couriers rode,
And fast their horses ran;
And many they saw, and to many they spoke,
But they found no Happy Man.

At last they came to a village gate,
A beggar lay whistling there;
He whistled and sang and laughed and rolled
On the grass in the soft June air.

The weary couriers paused and looked
At the scamp so blithe and gay;
And one of them said, "Heaven save you, friend!
You seem to be happy to-day."

"O yes, fair sirs!" the rascal laughed,
And his voice rang free and glad;
"An idle man has so much to do
That he never has time to be sad."

"This is our man," the courier said;
"Our luck has led us aright;
I will give you a hundred ducats, friend,
For the loan of your shirt to-night."

The merry blackguard lay back on the grass,
And laughed till his face was black;
"I would do it, God wot," and he roared with the fun,
"But I haven't a shirt to my back."

Copyright, 1871, 1880, 1899, by John Hay.

Each day to the King the reports came in
Of his unsuccessful spies,
And the sad panorama of human woes
Passed daily under his eyes.

And he grew ashamed of his useless life,
And his maladies hatched in gloom;
He opened his windows and let the air
Of the free heaven into his room.

And out he went in the world and toiled
In his own appointed way;
And the people blessed him, the land was glad,
And the King was well and gay.

A FAREWELL

Charles Kingsley was a clergyman and novelist. Many of his stories have become famous and are standard works of fiction. He was also a writer of poetry, and this is one of the best known of his smaller poems. It was written for a girl as farewell advice. Like all good people, he loved children very much, and delighted to write for them. The poem reminds us that it is better to be good and to do good and noble things than to be clever and win fame and fortune. "A Farewell" is printed here by permission of Messrs. Macmillan, publishers.

MY fairest child, I have no song to give you;
No lark could pipe in skies so dull and gray.
Yet, if you will, one quiet hint I'll leave you,
For every day.

I'll teach you how to sing a clearer carol
Than lark who hails the dawn o'er breezy down,
To earn yourself a purer poet's laurel
Than Shakespeare's crown.

Be good, sweet maid, and let who can be clever;
Do noble things, not dream them, all day long,
And so make Life, Death, and that vast Forever
One grand, sweet song.

THE DAFFODILS

William Wordsworth was one of the greatest English poets, and this poem is one of the many pieces in which he writes clearly and lovingly of Nature and the beauties of flower-land. It was written a little more than one hundred years ago, after the poet had seen a wonderful blow of golden daffodils on the shores of Lake Ullswater, not far from where he lived. The last four lines mean that the recollection of beautiful things seen with our own eyes is one of life's greatest joys.

I WANDERED lonely as a cloud
That floats on high o'er vales and hills,
When all at once I saw a crowd,
A host of golden daffodils:
Beside the lake, beneath the trees,
Fluttering and dancing in the breeze.

Continuous as the stars that shine
And twinkle on the milky way,
They stretched in never-ending line
Along the margin of a bay:
Ten thousand saw I at a glance,
Tossing their heads in sprightly dance.

The waves beside them danced, but they
Outdid the sparkling waves in glee:
A poet could not but be gay,
In such a jocund company;
I gazed—and gazed—but little thought
What wealth the show to me had brought.

For oft, when on my couch I lie
In vacant or in pensive mood,
They flash upon that inward eye
Which is the bliss of solitude;
And then my heart with pleasure fills,
And dances with the daffodils.

THE WRECK OF THE HESPERUS

A BALLAD means a story in verse, and should always be told in a plain, straightforward way. This beautiful poem by H. W. Longfellow is one of the finest ballads we could choose. The tragic story of the wreck of the vessel, the picture of the raging storm, the finding of the drowned child—all is told without waste of words, but in just the very words that mean most and stir the imagination of the reader.

IT was the schooner Hesperus,
That sailed the wintry sea;
And the skipper had taken his little daughter,
To bear him company.

Blue were her eyes as the fairy-flax,
Her cheeks like the dawn of day,
And her bosom white as the hawthorn buds,
That ope in the month of May.

The skipper he stood beside the helm,
His pipe was in his mouth;
And he watched how the veering flaw did blow
The smoke now west, now south.

Then up and spake an old sailor,
Had sailed the Spanish Main:
"I pray thee, put into yonder port,
For I fear a hurricane.

"Last night the moon had a golden ring,
And to-night no moon we see!"
The skipper, he blew a whiff from his pipe,
And a scornful laugh laughed he.

Colder and louder blew the wind,
A gale from the north-east;
The snow fell hissing in the brine,
And the billows frothed like yeast.

Down came the storm, and smote amain
The vessel in its strength;
She shuddered and paused, like a frighted steed,
Then leaped her cable's length.

"Come hither! come hither! my little daughter,
And do not tremble so;
For I can weather the roughest gale,
That ever wind did blow."

He wrapped her warm in his seaman's coat
Against the stinging blast;
He cut a rope from a broken spar,
And bound her to the mast.

"O father! I hear the church-bells ring,
O say, what may it be?"
"Tis a fog-bell on a rock-bound coast!"—
And he steered for the open sea.

"O father! I hear the sound of guns,
O say, what may it be?"
"Some ship in distress, that cannot live
In such an angry sea!"

"O father! I see a gleaming light,
O say, what may it be?"
But the father answered never a word,
A frozen corpse was he.

Lashed to the helm, all stiff and stark,
With his face turned to the skies;
The lantern gleamed through the gleaming snow
On his fixed and glassy eyes.

Then the maiden clasped her hands, and prayed
That saved she might be;
And she thought of Christ, who stilled the waves
On the Lake of Galilee.

And fast through the midnight dark and drear,
Through the whistling sleet and snow,
Like a sheeted ghost, the vessel swept
Towards the reef of Norman's Woe.

And ever, the fitful gusts between,
A sound came from the land;
It was the sound of the trampling surf,
On the rocks and the hard sea-sand.

The breakers were right beneath her bows,
She drifted a weary wreck,
And a whooping billow swept the crew
Like icicles from her deck.

She struck where the white and fleecy waves
Looked soft as carded wool,
But the cruel rocks, they gored her side,
Like the horns of an angry bull.

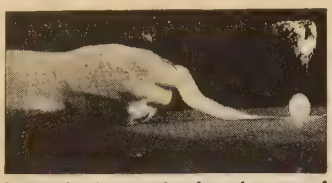
Her rattling shrouds, all sheathed in ice,
With the masts, went by the board;
Like a vessel of glass, she stove and sank,
Ho! ho! the breakers roared!

At daybreak, on the bleak sea-beach,
A fisherman stood aghast,
To see the form of a maiden fair,
Lashed close to a drifting mast.

The salt sea was frozen on her breast,
The salt tears in her eyes;
And he saw her hair, like the brown sea-weed,
On the billows fall and rise.

Such was the wreck of the Hesperus,
In the midnight and the snow!
Christ save us all from a death like this
On the reef of Norman's Woe!

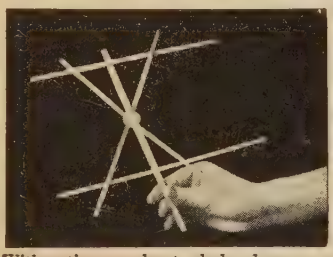
A SET OF SIMPLE TRICKS



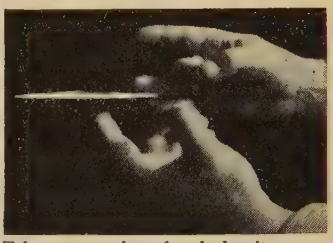
Cut a strip of paper, place it on the corner of the table, and make a silver dollar stand upon it upright in the manner shown in the illustration. The table should be quite level, and if it is so, the coin will remain erect without rolling. Then pull the paper away sharply and the coin will remain as it was.

Take a square piece of paper and make a cut from each corner to near the middle. Bend over all the right-hand corners to the middle and put a pin through the lot into a cork as shown. Then blow upon the paper and you will see that you have a fine little windmill.

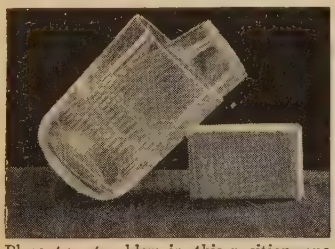
In a paper cut a round hole the size of a quarter. You can pass a fifty-cent piece through the hole by folding the paper double and bending the ends slightly upwards as shown. The action of bending the paper, when it has been folded has the effect of widening the hole sufficient to allow the larger coin to pass without tearing the paper.



With patience and a steady hand you can arrange straws in this position with a coin in the middle, so that you can hold the whole structure by one straw. Only five straws are used, and they support each other by the tension of their crossings. A nickel is a good coin for the purpose, as it is not too heavy.



Take a square piece of card, place it on your finger-tip with a coin right in the middle of the card and right over the tip of the fore-finger supporting the card. Flip the edge of the card with the middle finger of the other hand and the coin will be left on your finger.

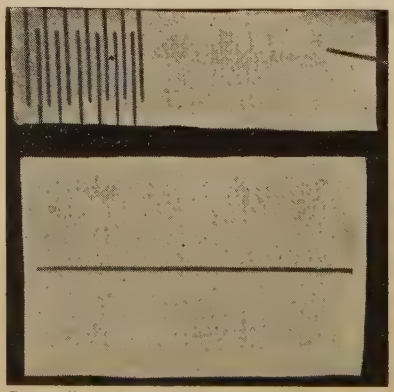


Place two tumblers in this position, one within the other, with mouth downwards, as shown. Blow into the larger tumbler and the smaller will be thrown out into your lap. Care should be taken to prepare for the sudden ejection of the smaller tumbler, otherwise, as it comes out, it will most probably fall upon the floor or table and be broken, and your trick will be entirely spoiled.

Place a few small pieces of copper and an equal number of small pieces of zinc inside a cut lemon, connecting the zinc and copper pieces with wire. To the last zinc piece and the last copper piece connect wires. In a few seconds you can feel the electricity generated by the acid of the lemon.

Place a coin on a tablecloth between two forks and under a glass as shown in the illustration. By scratching on the cloth just outside the glass, but not touching the glass, with the nail of one of the fingers, you can make the coin come towards you from under the glass. It progresses outwards by short successive steps, and finally comes to where it can be picked up without touching the glass at all.

Drive a pin into a cork in a bottle. Take four other corks and stick forks into their sides near the end. Then you can balance a plate on the pin by fixing up the corks and forks as shown in this picture.



Cut a slit down the middle of a piece of paper. Double the paper lengthwise and cut alternately from the two edges almost to the other edges, as in top picture. The paper is then in the form of a long, circular chain, through which a man can pass easily if the zigzags are carefully opened out.

Take a tapered glass large enough to let a silver dollar sink down a little distance, first having put a dime in the bottom of it. Blow sharply and the dollar will rotate and the dime will come out.

PAINTING WITH STENCILS

HOW TO MAKE A BEAUTIFUL TABLECLOTH

IT is possible, of course, to ornament a table-cover with all sorts of beautiful work, but one of the simplest and most effective ways is to stencil a pattern to form a border.

Stenciling is a type of decorative painting. It is used upon walls and ceilings as well as upon smaller things, such as curtains, book-covers, dresses, cushions, and so on.

Many big buildings, like concert-halls and churches, are decorated inside entirely by stenciling, but it is also quite easy to make simple little patterns for borders, and with them to decorate little things of our own. But how is it done?

Preparing the stencil plate

First of all we must understand what is meant by a "stencil plate." It is simply a piece of stiff paper with a pattern cut out of it. The pattern is so arranged that, when the "plate" is laid on any piece of material, colors can be painted through the holes right on to the material in the exact shape of the cut-out pattern. There are three great advantages in this method of painting: The outline of the pattern is always very neat; the pattern itself can be repeated any number of times (or on any other material) from the same plate; and beautiful shaded effects can be obtained very easily.

Stencil Brush

Now we are going to see how to make a stenciled border.

Choose a simple flower—say, a tulip—and draw it carefully on a piece of rather stout oiled paper. Draw it as *simply* and *severely* as possible, leaving out all detail. It will look something like picture 1, and be about four inches long from top to bottom.

Now go round the outline of each leaf and petal, as is shown in picture 2, enclosing each portion of leaf and petal in a separate space. When we have done this, and made all the lines between the spaces quite even in width, we must shade in each space with pencil-lines—picture 3 shows us how—as a guide to the next step.

Next, get a sharp pen-knife; lay the paper on a sheet of glass and carefully cut out each shaded-in piece, going round the outline with the point of the knife, and keeping the paper pressed firmly on the glass. Be very careful *not to cut beyond the shaded portion.*

When each little piece is cut out, we have made our first stencil plate. But before we can use it we must get a half pint of varnish from the painter, and varnish and paint over both sides of the plate. The varnish will harden and prevent paint soaking into the plate and rotting it. When both sides are varnished we must hang it up to dry, either near the window or in the open air. Suspend it by a thin string loop put through a pinhole in one corner, and see that it does not touch anything, for it is now rather sticky. We must not use it till it is dry and hard.

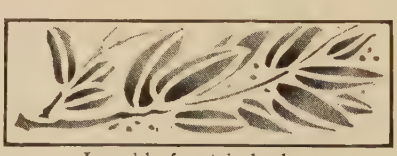
Festoon of apples and leaves for decorating a lamp-shade

The kind of brushes to use are short, round, stumpy ones of soft hog-hair; they can be purchased at most stores.

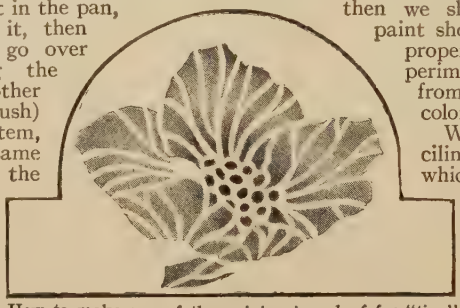
We can use ordinary artist's water-color paints in pans. These cost but a few cents.

Now we must begin to think about the table-cover which we are going to make.

Buy a piece of cheesecloth or a nice soft curtain cloth, which can easily be bought at any dry goods store. Cut it into a yard square. Straighten out one edge, and with drawing-pins fix it to a drawing-board or a flat table. Find the middle of the side (that is, 18 inches from the corner); on that point, and about 3 inches away from the edge of the cotton, lay the stencil plate quite straight. The stalk should point towards the edge and the flower inwards. Fix the plate in position *at the top* with two drawing-pins. Slightly moisten the paint in the pan, and rub the brush on it, then with a dabbing action go over all the holes forming the design. Choose another color (and another brush) for the leaves and stem, and do those in the same way. Then from the bottom gently lift the plate a little way and peep underneath. We shall be able to see how it looks, and whether we have got our colors deep enough.



Laurel-leaf curtain border



How to make use of the veining in a leaf for "ties"

Here are some things that we must try to remember:

1. Be careful not to get the paint too wet. Never dip the brush in water, but always moisten the paint itself, then rub the brush on the paint.

2. Always paint with a succession of dabs. Do not use the brush as an ordinary house-painter does, or you will make a smear and spoil the edge of the pattern.

3. Obtain the shaded effect by dabbing more at the base of the tulip petals than at the tips.

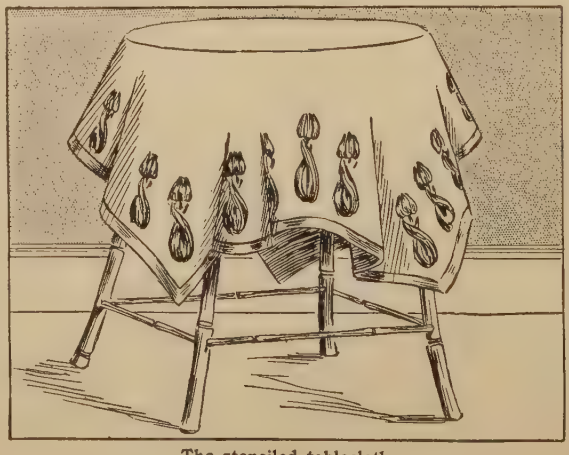
In choosing color, a deep yellow (almost an orange) shading into pale primrose for the flowers, and a dark green tipped with brown for the leaves, will look well.

Now we have to decide how close we want the next tulip to be, and make a small pencil-mark on our cotton, the necessary distance away. Space the remainder, along the side, with tiny pencil-marks as a guide. Unpin the plate, replace it over one of the guide-marks, and continue to paint. Probably we shall find that about nine tulips will space out well in a yard length—four on each side of the centre one. When we have done the other sides and hemmed the edge, our cloth will be finished, and look very charming, well worth much more than it costs.

If we keep our plate carefully pressed between the leaves of an old book, some other time we shall be able to use the design for something else — perhaps a border of tulips round a bedroom wall, or a single one to decorate a plain holland book-cover. Of course it will be better to begin by using our plate on an old piece of stuff, or on a piece of paper, before actually working on the table-cover; then we shall learn how wet the paint should be, and how to dab properly. We might also experiment with a little shading from dark to light tones of color.

We must notice the stenciling used in any buildings which we visit, and have a good look at it; we shall soon learn to detect it by the separateness of each little bit formed by the cutting out. Of course, if each little piece were not separate the design would not hold together in the plate. The pieces which are left between the cut-out portions are called "ties." We must always pay great attention to them when we make a new pattern.

There are many ways of using stencils and making elaborate and beautiful patterns with them. Sometimes one is used over another, the very big ones being made of tin or sheet copper. But these are very difficult to make, for they require the skill of an artist. Nevertheless, if we follow these directions we shall soon be able to make many useful and beautiful little patterns for ourselves, which will come in useful just now when we are beginning to think about the making of our Christmas presents.



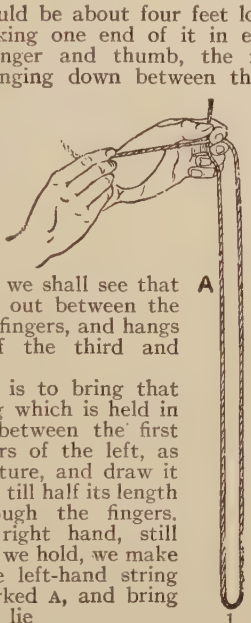
The stenciled tablecloth

When once the principles have been grasped, it is no more difficult to decorate a wall with many impressions of a plate, arranged as a frieze, than to make one impression on a book-cover.

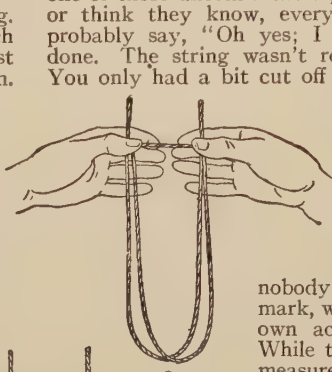
CUTTING THE MAGIC STRING

THIS is an old trick, but it is a very good one, and, improved to the form we are about to describe, it is very little known. It can be performed just as well by a girl as by a boy, and it has the great advantage of requiring no previous preparation. When we have once acquired the necessary skill, we can perform it at a moment's notice, all that we need being a pair of scissors and a piece of string.

The string should be about four feet long. We begin by taking one end of it in each hand between finger and thumb, the rest of the string hanging down between them. But the end in the left hand is not held quite in the same way as the other, though no one not in the secret would notice any difference. If we look at picture 1 we shall see that the string passes out between the second and third fingers, and hangs down outside of the third and fourth ones.

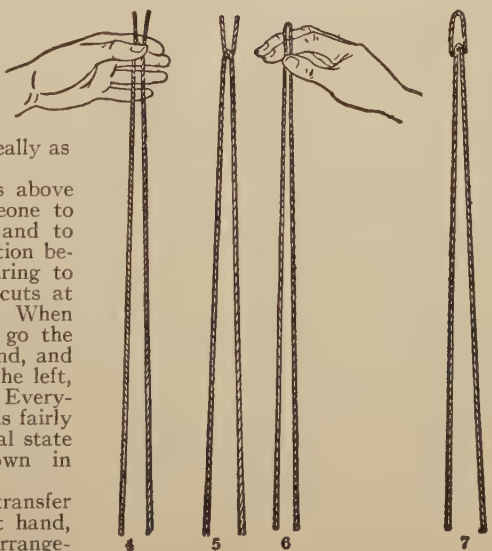


Our next step is to bring that part of the string which is held in the right hand between the first and second fingers of the left, as shown in the picture, and draw it towards ourselves till half its length has passed through the fingers. Then with the right hand, still retaining the end we hold, we make a "grab" at the left-hand string at the point marked A, and bring it up so as to lie level between the hands, as shown in picture 2. To anyone looking on, it seems as if you had merely gathered up the string in a double loop, but it is really as shown in picture 3.



Holding the string as above described, we ask someone to take a pair of scissors and to cut it in halves, the portion between the hands appearing to be the middle, and he cuts at that point accordingly. When he has done so, we let go the string with the right hand, and let it hang down from the left, as shown in picture 4. Everybody imagines that it is fairly cut in half, but the real state of things is as shown in picture 5.

Our next step is to transfer the string to the right hand, not disturbing its arrangement, but taking hold of it a little higher up, so that the upper ends, as well as the point where the two pieces of string cross each other, shall be hidden by the fingers. Asking someone to take hold of one of the long ends, we wind the rest of the string round our own left hand. This draws off the loose bit into the other hand, and when we again unwind the string it is found to be all in one piece, as at first. The little bit remains concealed in the right hand.



The trick of the magic string

But we have not yet finished. Somebody—one of those uncomfortable people who know, or think they know, everything—may very probably say, "Oh yes; I know how *that's* done. The string wasn't really cut in half. You only had a bit cut off one end." "Oh, you think so?" we retort. "Then I will do it over again, and this time you may measure the string before and afterwards." If nobody makes such a remark, we volunteer of our own accord to do this. While the string is being measured, we secretly double the bit that remained in the right hand, with the "loop" end upwards, keeping it concealed between the fingers and thumb. When the string is handed back after having been measured, we double this also in half, and, taking it by the middle between the right-hand fingers and thumb, draw up for an inch or so what is apparently the loop thus formed, but is in reality the little loop made of the short bit. Picture 6 shows how the string now looks, and picture 7 the real state of things. We let someone cut through the loop, and wind the string round the left hand as before. It is again found restored, and when measured will, of course, be found to have lost none of its length.

This is not an easy trick to describe clearly in print, but if we follow the instructions with the string in our hands, and study the pictures, we shall soon learn it. And it is worth learning, for it is a genuine sleight-of-hand trick, and such tricks are the most magical of any, and make a good impression.

LITTLE PROBLEMS FOR CLEVER PEOPLE

OUR fathers and mothers have spent many hours — perhaps days, perhaps weeks — of their lives in puzzling over problems and trying to find out riddles. We shall find in this part of our book some of the things that have puzzled them, with many new puzzles that we can work out for ourselves. There are many puzzles so strange and bewildering that thousands and thousands of people have never been able to understand them. Perhaps your father and mother may have been puzzled by these; but we shall try to make them so clear by pictures and simple answers that we shall all understand. The answers to the following problems are in the part of our book beginning on page 256.

1. DID GEORGE WALK ROUND THE MONKEY?

George was trying to tease the monkey which was seated on the top of a barrel-organ. But, although he walked all round the barrel-organ, the monkey always turned so as to face the boy the whole time.

When the boy has walked round the organ, has he walked round the monkey?

2. HOW MANY APPLES DID MABEL BUY?

Mabel bought some apples at three for 4 cts., and an equal number of 1 ct. oranges. If she spent 14 cts. altogether how many apples and oranges did she buy?

3. HOW DOES MARY GET THE EGGS?

Alice and Mary gather the eggs on the farm. One morning Alice discovers that several eggs have been laid on a small square island in the middle of a square pond, and, having no plank long enough to reach across, she leaves the eggs alone.

Mary sees them the next morning, and, looking round for a means to reach the island, finds two planks, neither of which will quite reach from the edge of the pond to the island. But they are her only means of access to the eggs, and, placing them so that she can step across them, Mary reaches the island and takes the eggs home in her basket. How does Mary reach the island?

4. WHO IS TOM'S UNCLE'S SISTER?

"Father, Tom says his uncle's sister is not his aunt." "Well, I expect he is right." If Tom's uncle's sister is not Tom's aunt, who is she?

5. HOW MANY STAMPS HAD THEY?

Three children—Jack, Frank, and Harry—divided some postage-stamps amongst them. Jack had half of them and one more; Frank had one more than half of those left; Harry had the remaining three. How many stamps were there?

6. HOW LONG WAS THE STRING?

A boy had two pieces of string, one of which was just twice as long as the other. He cut 6 inches off each piece, and then found that one was just three times as long as the other. How long were they at first?

7. WHOSE PORTRAIT IS IT?

One of the problems that have most puzzled our fathers and mothers is the old problem of a man looking at a portrait, saying: "Brothers and sisters have I none, but this man's father is my father's son." Whose portrait is it?

8. WHAT DID THE CORK COST?

A bottle and a cork cost 5 cts. If the bottle cost 4 cts. more than the cork, how much does the cork cost?

9. HOW MANY GIRLS ARE THERE?

If $14.50 is divided among fifty children, the girls getting 25 cts. each and the boys 30 cts., how many girls are there?

10. THE MISSING CANARIES

Grandfather gave a children's party at which twenty little guests were present. The old gentleman had prepared a surprise for the children, each of whom was to receive a live canary. But when the time came to present the canaries it was found that many of them had flown. The host sent out for others to replace them, saying to the messenger: "Bring back as many and half as many—that is, one and a half times as many—as there are left in the cage, and two and a half more."

When the messenger came back with these there were enough birds to go round, making twenty in all. How many canaries flew away?

11. HOW FAST WAS THE HORSE WALKING?

I was walking along a country road steadily at the rate of four miles an hour. I saw a horse and cart going in the same direction, and when I saw them they were exactly 220 yards in front of me. I overtook them in 15 minutes. At what rate was the horse walking?

12. HOW MUCH DOES A BRICK WEIGH?

A brick weighs six pounds and half of its own weight. What is the weight of the brick?

13. HOW MUCH ARE EGGS?

"What are eggs a dozen?" Mary asked.

"Two more for 24 cts.," said the grocer, "would make them 2 cts. per dozen less."

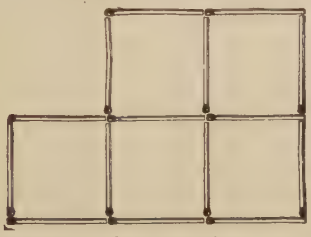
"Then," said Mary, "I will take 24 cts. worth." How many did she buy?

WHAT TO DO WITH A BOX OF MATCHES

THE problems given below may be performed either with matches or pins, provided the matches or pins are all of the same length. It will be much safer if the matches used are the safety kind that strike only on the box.

1. Take eleven matches and place them so as to make nine of them.

2. Arrange fifteen matches so as to form five squares of equal size as seen in the picture,



and then remove three matches s as to leave only three of the squares.

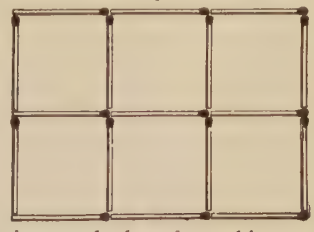
3. Take nine matches and place them so as to make three

dozen of them.

4. Take three matches and place them so as to make four of them.

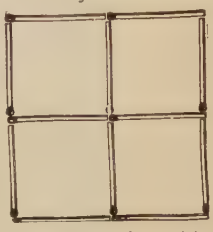
5. Place three matches in such a position that they will make six.

6. Arrange seventeen matches on the table so as to make six squares as shown in the

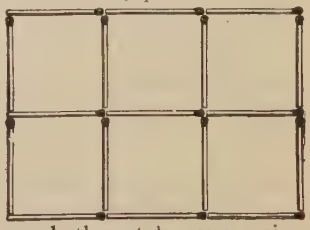


illustration, and then by taking away five matches leave three squares only.

7. Arrange twelve matches on the table so as to make four squares as shown in the picture, then after removing four matches place them so as to make three squares of the same size as the first squares.



8. Arrange seventeen matches on the table so as to form six squares as shown in the



picture, and then take away six matches so as to leave only two squares remaining.

ANSWERS TO PROBLEMS ON PAGE 1855.

MEASURES AND THEIR EQUIVALENTS

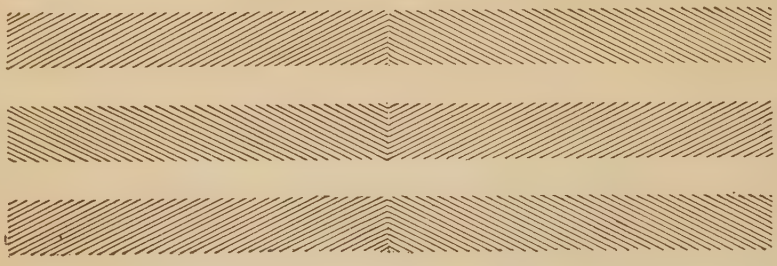
THE little girl cook, and even her big sister too, is often puzzled by the directions given in a recipe. She wonders how to add to her cake mixture a tablespoon of flavoring when she has only a teaspoon to measure the vanilla; or she wonders how to add a half pound of butter when she has no scales, or a gill of water, when she forgets that a gill equals half a cup.

In most recipes, a cupful means a level cup and not a heaping one. So when following directions, measure all materials level, that is, fill the cup or spoon heaping full and then level off with a flat knife. When measuring a cup of sugar or flour, sift lightly into the measure, then level off. To measure a half spoonful, fill the spoon and level off, then with a knife, divide in half lengthwise, not across the spoon; for a quarter spoonful, divide the half spoonful crossways. Do not use a big kitchen cup or a tiny teacup and think that the result will be the same.

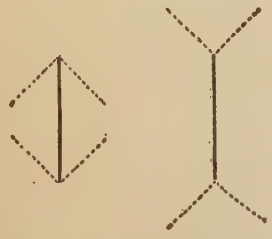
We will give here also a few weights and measures and what they mean so that the young cook may not have to puzzle over the directions given.

Twenty-seven and one-third grains, one dram; sixteen drams, one ounce; sixteen ounces, one pound; sixty drops, one teaspoonful; three teaspoonfuls, one tablespoonful; four tablespoonfuls, one-half gill or one-quarter cup; sixteen tablespoons, one cup; two gills, one cup; two cups, one pint; two cups, one pound of granulated sugar or butter; two pints, one quart; four quarts, one gallon; two tablespoons of salt or sugar, one ounce; four tablespoons of flour, one ounce; one tablespoon liquid, one-half ounce; one square of chocolate, one ounce; three and one-half cups confectioner's sugar, one pound; two and three-quarters cups of oatmeal, one pound; two and two-thirds cups of brown sugar, one pound; one quart of flour, one pound; and ten small, nine medium, or eight large-sized eggs, one pound.

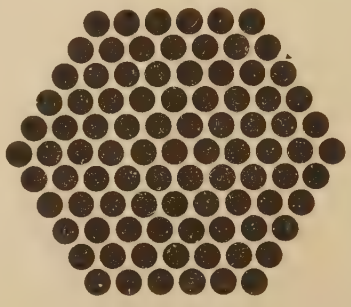
CAN WE ALWAYS BELIEVE OUR OWN EYES?



If you fix your eyes on the two white spaces between the lines it will appear as if the top space becomes wider at the ends, and as if the bottom space becomes wider in the middle. But both lines are perfectly straight.

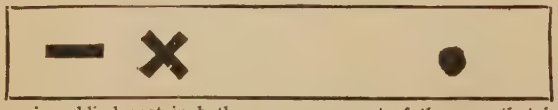


Which line is the longer? The black line on the right appears longer than the line beside it, but both lines are exactly the same length.

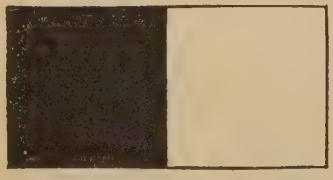


This shows how a circle appears to have sides and corners. These black spots, if looked at intently, seem to have six sides, like a honeycomb, but they are all quite round.

Who is the biggest? The policeman, most people would say. But the policeman is really the smallest and the little girl is the biggest. This curious effect was first used by a clever artist for Pear's Soap.



There is a blind spot in both your eyes—part of the eye, that is to say, is blind. You can prove this by closing your left eye and looking at the X with your right. Hold the paper a foot away, and draw it towards you. Though looking at the X, you will see the spot too, but at a certain point the spot will disappear. By drawing it still nearer to you, you will bring the spot into view again.



Which square is the larger? Most people would say the white, but the white is smaller than the black.

One of these sets of lines looks higher than it is wide, and the other wider than it is high, but both are square.

Turn the page round and round to the left. The plain rings will appear to revolve rapidly to the left, and the others to go slowly round in the opposite direction.

The poet was perfectly right when he said that things are not always what they seem. We cannot always believe our own eyes. Our vision of things is never quite perfect. There is always a little error in our sight, and this page shows us how we may deceive our eyes and make them believe that things are not what they are.

CONTINUED ON PAGE 247

A CHINESE EMPRESS ON HER THRONE

This picture of the late Empress Tze-hsi, the slave girl who rose to rule an empire, is typical of China, the land of all that is picturesque. The gorgeous costume of dazzling color is a true emblem of Eastern pomp, which was well represented by this able woman, who was once described as "the only man in China."

The Great Wall of China was built over seventeen centuries ago to keep out invaders from the north. It is 1,500 miles long, and in its course scales precipices and tops the craggy hills, as shown.

THE CHINESE REPUBLIC

THE OLDEST LIVING NATION OF THE WORLD

* * *

THE Chinese land covers one quarter of Asia, from the Pamirs to the Pacific and from Siberia to India. The mysterious and wonderful mother country, China proper, lies between its great provinces of Manchuria, Mongolia, and Turkestan, and the vast Pacific Ocean. In size China proper is about six times larger than the State of Texas, and its face is crossed by the outlying eastward ranges of mountains running from the great central heights, and by the immense rivers fed by the snows of Tibet, and joined by a network of streams on their long journey to the ocean.

It is estimated that over 300,000,000 people live in China, in its great cities and fertile plains, and on the banks of its waterways.

Among the treasures of many of our American homes are to be found curiosities brought by sailor friends and relations from this wonderland of the Far East, such as delicate embroideries in shining silks of gorgeous colors, dainty carvings in ivory, and exquisite little bits of fine porcelain or china. And as we have looked closely at the regular stitches in the beautiful fabric, we have seen that there is no untidy "wrong side" in Chinese work. We have wondered at the seemingly impossible puzzle of the ivory balls carved one inside the other, or at the unusual patterns on the thin little cups, and we have tried to picture to ourselves the far country whence the treasures came, and the patient and clever workers who made them. Perhaps all that we have succeeded in calling before our minds is the strange hairdressing of Chinese men, and the tiny feet of Chinese women, upon a misty background of an unknown land of flowers, with gracefully curved buildings and willow-pattern plate landscapes.

If we have gone to our map of China for help, very possibly we have been dismayed and discouraged by the great number of difficult names upon it, and queer ones indeed they seem to us, in a language so absolutely different from our own. So perhaps it will help us in our quest of a closer view of China and its people to learn a few words of Chinese first, and then, at any rate, we shall understand what some of the names mean, which will

give us a much better chance of remembering them, difficult as they are.

In this veritable Land of Mighty Streams, ho, kiang, and kong, all mean river: chan, or shan, and ling, stand for the mountains between which the rivers run, or through which, in some parts, they force a way between mighty gorges: pe, nan, tong, or tung, and si, indicate the points of the compass, north, south, east, and west: hoang, or hwang, is yellow, the imperial color of China: pei, is white: fu, or foo, and king, mean town or court: hai, the sea: chian, heaven, and so on.

Knowing a few words like these, we can easily find the mountains of the east, north, and south: Shan-tung, and the Pe-ling and Nan-ling ranges. The two last shut in the basin of China's greatest and most important river, the Yang-tse-kiang. Over 3,000 miles lie between its sources in the heights of Tibet and its mouth in the Pacific Ocean. It makes a magnificent waterway into the heart of the country, wide and deep enough for steamers to ply for a thousand miles through the rich plains of Central China, which the river itself has done much to form, by bringing down fertile mud, as the Nile does along its banks in Egypt.

THE RIVER OF CHINA'S SORROW AND THE TERROR OF ITS FLOODS

In its upper courses, separated from the lower by grand gorges which remind us of the Iron Gate on the Danube, it passes through a rich district of red earth—as large as Georgia and very thickly peopled. There are lakes in the basin of the Yang-tse-kiang which act as reservoirs in the time of heavy rains, so that its floods are not so disastrous as those on the Hwang-ho, or Yellow River, which drains through Northern China. "China's Sorrow" is one of the names of this river, so dreadful are the floods when it bursts its banks and submerges the surrounding country and towns. It is not navigable for long distances, like the Yang-tse-kiang, but on its banks, and in caves in its cliffs, live many of China's millions.

Water is not the only gift the inland provinces send to the mother country: another is sand—yellow sand—that has been constantly blown by the strong winds from Mongolia over parts of Northern China for centuries, till valleys have been filled up by deep beds of it, and the low hills covered with it. So here we have a yellow land with a yellow river, cutting its way through the soft soil, making deep cliffs on each side, and carrying its thick, yellow, sandy waters onwards, until they pour by ever-changing mouths into a yellow sea. One of the titles of the great Emperor of China was "Lord of the Yellow Land."

THE WONDERFUL YELLOW SOIL THAT GROWS SEVERAL CROPS A YEAR

The yellow basin of North China is even more fertile than the red basin of Central China, several valuable crops being raised in a year on the "loess" soil, as it is called.

The Si-kiang, or West River, drains Southern China, rising in the eastern spurs of the Tibetan heights, and making its way through dense forests, past mountains with treasures of every sort of mineral, and fields with crops that require a hot and moist climate. It is from Southern China principally that so many Chinese emigrate to find work in different parts of the coast of the wide Pacific.

We have often imagined the hum that rises from busy districts and towns in other countries, but from China—from that vast hive of human industry between the solemn, silent central mountains and the deep, wide sea—it seems as if there must be one continuous and mighty buzz from the whole country, so close are the great cities, so many are the millions of people living and working on the fertile plains.

And this buzz of multitudes is no new thing, as it is in our own country, where great industrial centres are scarcely a century old; neither is it caused, as it is with us, by the whir and thump of machinery and the noise of the iron horse on his journeys to every corner of the land. Railways and machinery are, comparatively speaking, only just starting in China, the oldest living empire in the world.

THE LAND OF ETERNAL SAMENESS WHERE CUSTOMS SELDOM CHANGE

For thousands of years her people have been steadily working, growing in numbers and changing rulers, suffering the horrors of war and enjoying the blessings of peace, but always busy in

THE NATION FOUR THOUSAND YEARS OLD

This map shows the extent of the great Empire of China, said by historians to have existed for more than 4,000 years. It has remained practically unchanged all that time, but is now awaking everywhere to new life. The various places round the coast that belong to different European nations are marked in the map.

the same old ways, making the same things, cultivating the ground on the same methods for centuries, learning the same lessons in the same language, and competing in the same examinations to fill the same Government posts.

It is difficult for us who are all for progress and new ideas, and dislike standing still, to understand this steady keeping to old ways. Two thousand years ago the ancestors of most of us were still in the wilds of Europe—very rough persons, who would find us very much changed in language, manners, and dress from themselves.

Now, the written history of China goes back for 4,000 years—nearly twice as long as that of Europe—so that when Europe was just beginning to make for civilized ways and thoughts, the Chinese nation was 2,000 years old. But she lost the advantage of her start of 2,000 years by standing still, going to sleep, and keeping herself to herself for centuries while the young Western nations were forging ahead, developing governments and education and inventions.

THE LONG SLEEP OF THE CHINESE PEOPLE AND THEIR HATRED OF NEW IDEAS

There are many reasons that account for the long sleep. We will only speak of two that will help us to understand the history of this country, so unlike our own. One is that the Chinese have always greatly revered their parents and ancestors, going so far as to make it a first duty to carry on the work of life in exactly the same way that their forefathers had handed down.

Another reason is that, with few exceptions, the Chinese have stayed at home within the limits of their own country. Then, as they also seldom encouraged foreigners to visit them—indeed, they rigidly kept them out, as a rule—no new ideas of progress and reform, no new knowledge of outside discoveries and inventions, could penetrate the wall of reserve that shut in their heavenly, or celestial, kingdom, so superior, as they believed, to the rest of the earth. And, as time went on, they hated anything new or foreign more and more. But that is changing now.

Some say that ages ago the ancestors of the Chinese came from the Tarim basin and settled on the yellow loess-beds where it was so easy to grow food. Anyway, here they lived, advancing in civilization for long, long years, before they spread across the forest-covered mountain ranges which separate the basin of the Yellow River from that of the Yang-tse-Kiang. Here, too, the tribes flourished and grew, and in time united under one ruler; the government became more settled, and all sorts of arts developed, such as the rearing of silkworms and the weaving of silk. This has ever been one of China's greatest and most profitable industries.

CONFUCIUS, THE GREAT TEACHER WHOSE WORDS ARE LAW TO MILLIONS OF MEN

Nearly twenty-five centuries ago a great teacher and leader arose, named Confucius, who, during his wandering and hard life, tried to find out how best a man could do his duty to his neighbour, and how best he could learn to govern himself. His teachings have been law to countless millions of his fellow-countrymen, his temples are found all over China, and his books have been the foundation of all learning through the centuries—for Confucius collected and set in order the history of the empire, and inspired a great many books in which his teaching is set forth.

A few hundred years after his death, a prince of China ordered a great burning of the books of Confucius, and cruelly treated those who tried to keep them. One punishment was to send them to labor on a great wall that he was building across the north of China, to keep out Mongolian horsemen, who were descending on his country. Twenty to thirty feet high, twelve feet wide at the top, faced with granite or hard brick, with many towers of defence, this wonderful wall runs over hill and valley, across sand and river, up the face of the rocks, for 1,500 miles along the north border-line of China. This wall still divides China from Mongolia; but it did not keep the Mongols out, any more than the Roman wall across Britain kept out the Picts and Scots.

THE GREAT SILENT DESERT WHERE CHINA'S GREAT WALL LIES BURIED

One of the last explorers to return from Central Asia is Dr. Stein, and the discoveries he made there are of importance and interest in connection with this great wall.

For miles and miles, as far as the eye can see in the basin of the Tarim River,

MEN, WOMEN AND CHILDREN OF CHINA

A woman and child of Macao, a Portuguese settlement in China.

Chinese girls of various ages engaged at embroidery work in a mission school, Canton.

A young lady of Canton dressed in her best walking costume.

A choir of Chinese boys at a mission school. The study of expressions on the faces in this picture is very interesting, as only two of the boys in the group knew that they were being photographed.

A Chinese woman with tiny feet. The cruel custom of crushing the feet of girls has been in fashion for 900 years.

A group of Manchu gentlemen. The Manchus conquered China in 1644 and founded a long line of emperors. They introduced the wearing of pigtails into China.

A typical Manchu lady. The Manchus were long the ruling class in China, most Government officials belonging to that race.

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there stretches sand—nothing but dry, parched sand, that has fought and conquered mankind, overwhelming towns and villages, and sweeping away a flourishing civilization. Of life there is practically no trace. Men have fled before those advancing grains of sand, that they were powerless to check; animals have died. Only one or two plants are able to exist in those desolate wastes. It is a land of sand and silence, of which some pictures are found in a later volume of this work.

In these awful wastes, beneath the numerous sand-dunes, Dr. Stein made some interesting discoveries. He found that the Great Wall of China, which hitherto was thought to end at the foot of the Nan-Shan Mountains, does not end there at all. Far away to the west in the Tunghwan Desert he found the remains of a great wall, with watch-towers at intervals of two or three miles, that practically joins the wall at the foot of the Nan-Shan Mountains.

This, he believes, is the true Great Wall of China, and the wall which we have always looked upon as the great wall is, apparently, much more modern.

THE HISTORY OF A RACE THAT IS BURIED UNDER THE SANDS OF CENTURIES

There, from those silent and deserted houses and watch-towers, Dr. Stein has excavated that terrible sand, little by little, and his labor has been well repaid. Wooden slabs, with carefully wrought symbols and clay seals, private letters, official documents, frail materials of cotton and silk, and ancient paper, have all been recovered from the sand under which they have lain for many centuries, and these documents, when translated, may give us a history of the long-vanished race which once occupied the land that is now a great sandy waste, where life is insupportable.

We can imagine with what fears these ancient people saw the sand creeping nearer and nearer; how they battled with it valiantly and tried to keep it from their homes; and how, at length, the sand slowly crept up to the houses and cottages, and into the rooms, driving the inhabitants forth, and gradually covering the entire place in a thick layer. But although the sand has destroyed, it has also preserved, and the relics which have been found will throw much light upon those ancient and deeply interesting times. More than a hundred years before the birth of Christ regular trade was opened up with Central Asia by China, and caravans began to wind along the routes from one oasis to another across the deserts, through the passes of Mongolia and Turkestan, to Tibet, carrying goods for trade by the infinite labor of men and dumb animals.

THE GOLDEN AGE OF CHINA WHEN TEMPLES WERE BUILT AND BOOKS WERE PRINTED

Later, the empire suffered from many disturbances and divisions, and the struggles among several small rulers to be first and foremost. It was during these centuries, about the times when the Angles and Saxons were seeking their new homes across the North Sea, that the Buddhist religion took hold in China, though it had been introduced from India some centuries before. Temples were built all over the country, to house the thousands of images that were brought by the priests and monks.

The three centuries after this are considered by the Chinese as one of the most glorious periods in their long history. Books and authors, schools and colleges, examinations and degrees, occupied a great place in public life. About the time when King Alfred was setting scholars laboriously to work with their pens and paint-brushes to copy manuscripts, Chinese records mention the printing of books by wooden blocks. About this time, too, an immense encyclopædia was written. The fame of this learning and of the gorgeous palaces and riches of China was spread to Europe, chiefly by Arab traders, and ever since the romance and mystery of China has attracted the imagination and longing of the West.

HOW THE DOOR WAS OPENED FOR EUROPE TO GET ITS FIRST PEEP OF CHINA

But it was not till the thirteenth century that the famous Marco Polo opened the door for Europe to get a passing view of the wonders of the dim and mysterious land of the Far East.

Early in that century the Mongols had gradually been getting more and more power on the borders of Central Asia and in the north of China. When the great leader Jenghiz Khan, the "Greatest of the Great," flashed over Western Asia and ruled over an empire stretching from the China Sea to Russia,

Here we see a Chinese dinner-party. Instead of knives and forks many Chinese use chopsticks to pick up their food, and are very skilful in conveying the food to their mouths without dropping it in their laps.

The Chinese believe that a dragon rules over the heavenly bodies, and at eclipses he is supposed to swallow the sun or moon. To appease him a ceremony called the Festival of the Dragon-boat is held, as shown here.

This picture shows a Chinese tea-house of the better class in Shanghai. Here wealthy Chinamen pass their time, chatting over the teacups and discussing business. Some of these houses are fitted up very elaborately.

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some of the barriers that had hitherto prevented entry into China were swept away. The huge empire was divided at his death among his sons, and a good deal of intercourse followed between China and Persia, Tibet and Mongolia.

THE GREAT MONGOL EMPEROR WHO MADE PEKING HIS CAPITAL

It was the grandson of Jenghiz Khan, Kublai Khan, who welcomed Marco Polo so kindly to China, and sent him on so many missions to the wild provinces on the borders of Tibet and other distant parts of the empire. Deeply interesting is the account of Kublai's reign by Marco Polo, as well as the writings of other travelers who seized the opportunity of exploring the heights of the Pamirs and the Tarim basin; and some even crossed the Hwang-ho into China itself.

Kublai added Southern China to his dominions, and made his new capital at Peking, the Court of the North. This great soldier proved equally great as a ruler, for he encouraged education and helped China in many ways.

The last of the great Mongol rulers was Jên-tsung. He gave an order that Confucius should be held in great respect. After his death, rebellions and murders of emperors, great misgovernment, and other troubles brought the rule of the Mongols to an end. In the fifteenth century the Chinese drove them across the Great Wall to the Altai Mountains, and Mongolia became a province of the empire under the Chinese Ming family, or dynasty, of emperors, which lasted nearly 300 years. There were troubles at home and abroad during this time, difficulties with the Mongols and the Japanese, and, most important of all, the door which hid the Celestials from the Western "barbarians" began to open just a little. The Portuguese and Spaniards appeared in China in the sixteenth century, and a Chinese fleet sailed as far as the Red Sea.

A WONDERFUL CHINESE ENCYCLOPÆDIA IN THOUSANDS OF VOLUMES

Very beautiful porcelain was made during the Ming dynasty, and another large encyclopædia was brought out, which occupied many editors and assistants for several years. It is said that this is the largest encyclopædia in the world. It runs to many thousands of volumes, and a copy of the first edition is now to be seen in the British Museum in the table cases in the King's Library. The Portuguese traders made but little impression on China, but the Jesuit missionaries managed to make their way inland in China to preach the Christian religion.

There are many splendid remains of the great Ming dynasty in China, especially near Peking. Among them is a long avenue of large stone animals in various postures, leading to the wonderful tombs of the emperors. There are also many magnificent memorial archways.

As the Ming dynasty was nearing its end, the Manchus, descendants of old Mongolian enemies of China, settled in Manchuria, about the River Amur, and made increasingly successful attacks on the empire till, in 1644, the Manchu line of rulers found themselves firmly seated on the throne, inside the great wall that was built centuries before to keep out invaders. Only in 1912 was the boy emperor driven from the throne.

THE GREAT STRUGGLE OF THE NATIONS OF EUROPE TO SET FOOT IN CHINA

Since the middle of the last century a grim and never-ending game of the "King of the Castle" has been going on between China and the Western Powers that are so anxious to gain footholds in her rich and ancient empire. The chief object for which these footholds were desired was to force the Christian religion and Western ideas upon a country which detested them, and to open up trade with people who had so much to sell, and whose great numbers mean great buying power.

Little by little China has been forced to give way, and she has had to admit, one by one, her assailants into some part of the enchanted "Castle." Portuguese, Dutch, Germans, Russians, and British for years carried on the struggle, and after wars and sieges and stormings, and endless discussion of a more peaceful nature, the various foreign nations at last gained the right of entry into the land so long closed to them.

It was in 1842 that, by the Treaty of Nanking, certain treaty ports were opened to foreign trading ships, and, as time went on, more and more concessions had to be given to the foreigners; concessions and money were often exacted as a punishment

SOME FAMOUS CITIES OF CHINA

This picture shows one of the walls of the city of Peking. The city is divided into two separate towns, one for the Manchus and the other for the Chinese, each surrounded by its own wall, from thirty to fifty feet high.

Here we see a busy market in the Manchu, or Tartar city of Peking, which is the principal part of the Chinese capital. This street is in some parts 200 feet wide.

In this picture we see the famous Hall of Classics in Peking, containing 182 pillared slabs of granite with all the Chinese classical books engraved on them.

This is a view of Victoria, capital of Hong Kong, the British possession at the mouth of the Canton River. It is a British naval station and an important commercial centre. The mountain at the back is Victoria Peak.

Shanghai is the most important city in the Chinese Empire, so far as European trade is concerned. The native part of the city is indescribably filthy, but on the north the European city, shown here, is handsome.

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for killing missionaries or other representatives and burning their property. Shortly after the settlement of Nanking, a terrible rebellion devastated a large part of China for fifteen years. In 1864 the British were able to help the Government to restore order. In the centre of Trafalgar Square stands a statue of that fine soldier and man of action, General Gordon, often spoken of as "Chinese" Gordon, from the part he took in putting down this Taiping rebellion, as it was called.

THE FIRST TROUBLED YEARS OF CHINA'S AWAKENING

His campaign in the delta of the Yang-tse-kiang, among the streams and canals and lakes, all broad and navigable channels, was most carefully planned, and was full of exciting events. In one action an armed steamer, with a crew of forty men, got the better of a force of many thousand rebels. He drilled the Chinese forces, urged on men less brave and energetic than himself, and showed the Chinese not only how to make war, but how to end it.

These first years of China's awakening after the long, numbing sleep of centuries have, indeed, been full of trouble and pain. There have been almost incessant wars with the neighbors who could no longer be kept out, with Russia, France, Germany, Japan, and during these wars China has learnt by sad experience that her old ways of warfare, though picturesque in their setting, and almost sacred from long custom, were useless against those of her opponents. Now Chinese troops are drilled by Western methods.

THE BOXER RISING AND THE FLIGHT OF THE EMPEROR FROM PEKING

Naturally there has been much feeling against all the new ideas in this most conservative country in the world; the first railways were torn up as soon as laid; telegraphs were bitterly opposed, and Christian missionaries always carried their lives in their hands. So greatly have they been hated, in spite of the ability and devotion they have shown, especially in organizing relief in times of dreadful famine and plague, that in 1900 a great rising—called the Boxer rising—took place, against the missionaries at first, but eventually all the hated foreigners were attacked. For two terrible months the European residents in China were in great danger. Many were killed, and others suffered all the terrors of a siege. They were shut up in Peking, with a howling mob eager for their lives outside, till relief came, and the Boxers were driven away. The allied forces made their way to Peking, and the emperor and his aunt fled far westward for safety, till peace was settled and justice done.

The efforts of Christian missionaries in China have been sadly hampered by the actions of traders of their own faith, by their want of principle, and by the bad example that many of them have set. Great wrong has been done in the past by Englishmen in furnishing, for the sake of money, arms and help to the rebels who were devastating China when Gordon came to the rescue, and by their insisting on sending into China the poisonous drug opium, against the wishes of the rulers; this also for the sake of gain.

The smoking of opium, which destroys men body and mind, has been a terrible curse to China. Of late years strong efforts have been made to put an end to the dreadful trade. As a consequence, the practice of opium smoking has been much reduced, and soon the cultivation of poppies and the importation of opium will cease altogether.

THE SIGHTS OF THE CITY IN WHICH THE EMPEROR OF CHINA LIVED

Foreigners have now gained more than a mere foothold on the shores of China. It is comparatively easy for them to pass from end to end of the beautiful and wonderful kingdom. Many travelers have already done so, and they have shown us, by words and photographs, the marvels of this long-shut-up land. Let us, too, pass in.

There are three main ways of reaching China. We can go to Europe and then by the Siberian Railway, branching off through Manchuria, and crossing the Great Wall to Peking; or we can travel to the East by going westwards—that is, by train across our mighty continent to the Pacific, where steamers take us across to its other side; or by steamer across the Atlantic and then through the Suez Canal, to any chosen port.

All are most delightful and interesting journeys. Let us start at the "Court of the North." Peking contains at least a million inhabitants, and is near the Pei-ho River, at the mouth of

which is its port, Tientsin. Peking is really made up of two cities—the outside Chinese city, where business is done, and the inside, or Manchu-Tartar town, where the foreign embassies are.

The emperor held his great court in an enclosure full of splendid buildings in the centre of the Tartar city. To this famous Forbidden City very few foreigners ever gain admission.

Grand, indeed, were the pageants to be seen when the emperor visited the Temple of Heaven to pray for a good harvest, leaving upon the mind a dazzling blur of golden yellow—the imperial color of the Lord of the Yellow Land—of brilliant touches of blue, green, and crimson, as the trains of high officials in gorgeous array passed in the procession. Long were the ceremonies, bowings, and prostrations, endless the prayers and readings from silken scrolls, as the incense floated towards heaven from bronze censers.

In China men used to go on being examined all their lives, chiefly in order to obtain appointments. There were examination centres all over the country, but it was to Peking that thousands came every year to try to get into the highest college of all.

In Peking are the imperial factories where beautiful silks and china are made, which the emperor gave as presents, and many splendid buildings, temples, tombs, palaces, and fairy-like gardens, stand out in striking contrast with the dirt and poverty everywhere to be seen. The dust—yellow dust—is dreadful in Peking, and penetrates into palace and hovel alike.

There are railways now being rapidly developed in many directions, especially in the rich delta plain of China, connecting the chief ports, and running far inland. Steamers, too, ply on the network of rivers and canals, besides the old-fashioned boats with square sails, called junks, so familiar in Chinese pictures. Where the shifting bed of the Hwang-ho has to be crossed, the bridges are some of the longest in the world.

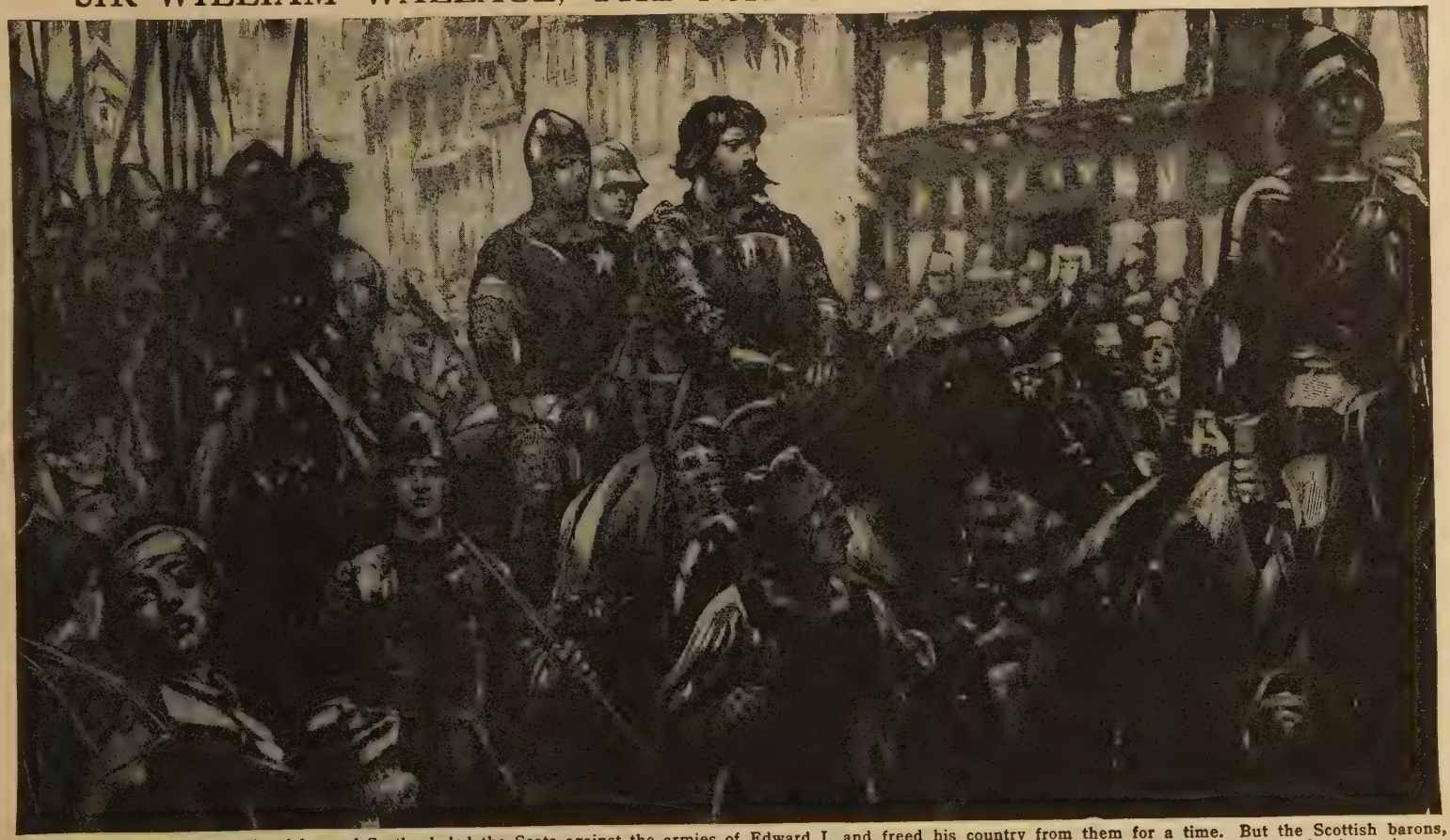
Shanghai is at the mouth of the Yang-tse River, and is one of the chief trade centres in the country. Here we find rows of European houses and shops, with their names hanging downwards, instead of across a signboard; and the public gardens are full of most glorious flowers. Crowds of people, European and Chinese, rich and poor, throng the streets, and factories with smoky chimneys remind us of the new ways that have begun to replace the old.

Nanking—the Court of the South—is also a very important place on the Yang-tse River, and higher up still is Hankau, a great place for the tea trade. The porters waiting about for work on the tea steamers make us think of our dock laborers at home.

From Hankau it is still some distance to the wonderful Yang-tse gorges, a thousand miles up the river from Shang-

The tombs of the Ming emperors of China, near Peking, are approached through five magnificent gateways, and up a road a mile long, by the side of which stand immense stone figures of men, camels, elephants, and griffins. The appearance of this lonely road, with its great silent figures on either side, is strange indeed.

SIR WILLIAM WALLACE, THE NATIONAL HERO OF SCOTLAND



Sir William Wallace, the national hero of Scotland, led the Scots against the armies of Edward I, and freed his country from them for a time. But the Scottish barons, who were jealous of him, because he was not of noble birth, did not uphold him, and he was defeated at the battle of Falkirk. Afterwards, he was betrayed, taken prisoner, loaded with chains, and brought to London, where he was led through the streets, as we see here. He was then tried, and put to death in a horrible manner as a traitor to King Edward I, who claimed to be feudal lord of Scotland, and held that any Scot who fought against him was a rebel.

WHAT THIS STORY TELLS US

EVERYONE should love his own country; and everyone who loves his country wants it to be free. But we do not always mean just the same thing by Freedom or Liberty. Sometimes, when we say that people have been champions of liberty, we mean that they have fought against oppression of every kind—oppression by tyrant kings or tyrant soldiers, oppression of the weak by the strong. But sometimes we mean that champions of liberty have been ready to suffer and to die in fighting the one kind of oppression which is most hateful of all—oppression by foreign rulers or conquerors. It is about champions of liberty of this particular kind that we read here; men who sacrificed themselves to free their land from a foreign yoke. There were some who succeeded and some who failed, some who died fighting and some who were foully done to death; but the names of all alike are held in honour as national heroes.

HEROES OF THE NATIONS

CONTINUED FROM PAGE 66

THE Bible tells us about the history of the Jewish people down to the time when they were carried away captive to Babylon, and were afterwards allowed to return to Jerusalem by the Persian king. But it does not tell us their history between that time and the time when Jesus was born.

Now, during that period there arose a mighty kingdom of Syria, the rulers of which were descended from a Greek general who had been in the army of Alexander the Great; and these kings ruled over Palestine too. But at last one of them, named Antiochus, resolved to make the Jews give up worshipping God according to the Hebrew law, and to offer sacrifice to false gods. Then there arose one, Mattathias, who, with his sons, refused to obey the orders of King Antiochus; and when they saw Jews ready to sacrifice to false gods, they slew those Jews and called upon all the people to fight for freedom, so that they might worship the God of their fathers. Among the sons of Mattathias, the most skilful warrior was the second, whose name was Judas, surnamed Maccabæus, which means the Hammer. Therefore men call his family the Maccabees, because they made Maccabæus their general. The story is a very thrilling one.

Judas gathered together a troop of Jews who were ready to die for faith and freedom; and though they were few in number, yet they routed utterly great hosts which the King of Syria sent to subdue them, and won back Jerusalem from his soldiers.

When men saw this small band making havoc of vast armies, they gathered to Maccabæus, nor could the Syrian generals in any way subdue them. And though Judas himself was at last slain in a battle, where his followers were so few that they were overwhelmed by the numbers of the enemy, yet it was indeed he who at that time won freedom for the Jewish people.

We will leave these very ancient times and turn to English history. Here England is fortunate; for no foreign conqueror has set foot on her soil since Duke William of Normandy, so that we must go back to his days to find an English patriot of the particular kind we are talking about. Duke William overthrew King Harold at the battle of Hastings, and made himself King of England; but when he thought that he had made himself lord of all the land there appeared a valiant champion called Hereward the Wake. He lived near Peterborough.

Now, whether Hereward was a cousin of some great English earls we do not know for certain; but

he himself was a landless man, and could not gather a great army. Yet he and his band made themselves a camp on the Isle of Ely in the Fen Country, and they fell upon the Normans so fiercely that the Conqueror himself, the greatest general of the time, had to come with a great army against them before they could be driven from the "Camp of Refuge." But after that Hereward and his men could make no headway against the Normans, until at last they saw that it would be vain to struggle more; and Hereward made his peace with William. After all, however, good came of that in the end, because Normans and English grew into being one people, greater than ever the English would have become by themselves.

How the English kings tried to be masters of Scotland and Wales

The English never had to fight for their own freedom; but sometimes they have conquered other nations, and sometimes those other nations have won their freedom back. The English people themselves won the land of England from the Britons; but the Britons held possession of the mountainous land of Wales, and the Kings of Scotland were not conquered by the Kings of England.

Still, the English Kings wanted to make all the people of the island into one nation, and at last King Edward I. very nearly succeeded in doing so. He did indeed conquer Wales; but he found that a very difficult task, for the hero of Welsh liberty, the Prince Llewellyn, fought against him valiantly, and persuaded all the Welsh to join together and fight against Edward. Nevertheless, Edward overcame him, and he was slain, and Wales became a part of the kingdom of England, although more than a hundred years later there arose another champion of the Welsh, Owen Glendower, in whose lifetime the King of England could not make his will prevail in Wales.

William Wallace, the young man who led the Scots against the English

King Edward I. strove hard in like manner to bring Scotland under his sway. For when the young Queen of Scots died, who was called the Maid of Norway because she was born and bred in that land, the Scots were divided as to who should be king after her; and they asked King Edward to judge between the men who claimed the throne. And of these men John Balliol said that he would own Edward for his overlord and the King gave judgment in favour of Balliol. But afterward he said that John Balliol, having sworn to be loyal to him, had broken his promise, and he drove Balliol from the throne, and sought to rule Scotland with English officers.

It would seem that the barons of Scotland did not greatly care whether Edward was king over them or another; but the common folk would not endure to be ruled by English masters; for the English soldiers treated them as though they were a conquered people.

Then there appeared a young man named William Wallace, who was very strong and skilful with all manner of weapons; who, when some English soldiers tried to rob him, turned on them and slew them with his staff, though they were armed. The English set a price upon his head, and he fled to the hills, and there gathered round him many valiant men who were determined to rid their native land of foreign masters. Then the English governor gathered an army, and Wallace awaited him by the bridge near Stirling.

How the peasants rallied round Wallace and drove the English out

So the English army began to march across the bridge, which was very narrow, thinking to set themselves in battle array and then crush the Scots, of whom most were but peasants. But while a part of the army was on one side of the river and a part on the other, Wallace set upon them suddenly, putting them utterly to rout; and the fame of his exploit stirred up many more of the Scots to join Wallace, and the English were driven out.

But thereafter Edward, who had been abroad, went back to England, and marched into Scotland with a strong army, having many mail-clad horsemen and archers; and the Scots lords still held aloof from Wallace, not willing to be led by a captain who was not of noble birth. Nevertheless, Wallace gave battle to King Edward at Falkirk, having his men all on foot and armed with long spears; and he and his men fought so stoutly that the horsemen

JOAN AT THE CROWNING OF THE KING

These two pictures bring home to us the great wonder of the story of Joan of Arc. A simple peasant maid, she put on her armor to deliver her country, and in the bottom picture we may fancy her at rest after a great fight. The large picture shows her in the supreme moment of her life, when she took her place by the throne of the King of France, who was able, because of her victories, to be crowned in peace.

could in no wise break through their line, till Edward bade his archers send a storm of arrows among them. Then, great gaps being made in the ranks of the Scots, the English charged through, and routed them.

But, even after this, Wallace, having escaped, went on fighting against the English; till one day a false knight betrayed him into the hands of English soldiers, and he was taken a prisoner to England.

How Wallace died for Scotland, and Joan of Arc rose in France

King Edward, instead of treating Wallace as an honorable and valiant foe, declared that he was a base rebel, and put him to a shameful death. Yet the Scottish people were no more willing than before to yield to the English, and how they found a leader in Robert Bruce, who drove the English out and made Scotland a free land once more, is told in the story of the Kings of Scotland in the BOOK OF MEN AND WOMEN.

It was more than a hundred years after this that the greatest of England's soldier-kings, Henry V., conquered half of France, dying before he could accomplish more; and after his death his brother, the Duke of Bedford, strove to complete what Henry had begun. The staying of the English conquest is one of the most wonderful stories in history, seeing that it was not the work of a warrior practiced in arms, but of a simple peasant maiden, who is called Joan of Arc. To her, while but a young girl dwelling in her native village, there came voices and visions, bidding her to arise and save France.

The brave and stainless maid who led the French to victory

After a time she became so very sure that this was, indeed, no silly fancy, but the very bidding of God, that she began to persuade those about her to believe it. She went to the place where the King of France was, and though men mocked at her at first, yet soon they were convinced by her purity and her earnestness that she had, indeed, been raised up by God to deliver the land; and the King sent her, clad in white armor, at the head of a troop of horsemen, to the town of Orleans, which the English were besieging. She drove them from the walls. The rude soldiery, with that selfless and stainless maid for their captain, learned to feel shame for all foul speech and foul thought, and followed her as a leader sent from heaven. Wherever she went, it seemed that the enemy must be scattered before her, till the English deemed that she must be a witch, though others held her to be a saint. By her victories she gave the French new heart and hope.

Yet at last she was taken prisoner through treachery, because, being pursued by the enemy after a battle, some Frenchmen shut the gates of the fortress into which she should have escaped. Joan was thereupon brought to trial, as being a witch and a heretic, and was condemned by her judges, who were French, but was given over to the English to be punished. And we have to write with sorrow to-day that they burned her alive in the market-place at Rouen, in Normandy. But this is certain, that from that day the English seemed to feel that the hand of God was against them, and they were no more successful in that war, but were presently driven out of all the land that Henry V. had won. As for Joan of Arc, who is called also the Maid of Orleans, she, though she died a death so cruel, lives for all time as a great example of stainless heroism.

How William Tell shot at the apple on his little boy's head

There are no people who love liberty more dearly than those who dwell among the mountains or by the sea. There are two small nations in Europe which were once under the yoke of a foreign oppressor, and each of which found heroic leaders to win their freedom. One is a nation of mountaineers, and the other a sea-going folk.

The first of them is Switzerland, which once was subject to the Austrian archduke, who was sometimes emperor as well. Switzerland is divided into districts which are called Cantons; and an officer appointed by the archduke used to rule them, and to rule very harshly.

Tradition relates that there was a skilful archer named William Tell, who would not obey an order that all men were to take off their hats to the archduke's hat, which was a kind of crown. So he was taken with his little son, and an apple was set on his son's head, and Tell was bidden to shoot at the apple;

THE CRUEL DEATH OF A STAINLESS MAID

The Maid of Orleans led the French army to so many triumphs that the English declared she was a witch, though others held her to be a saint. After a battle, some Frenchmen closed a fortress into which Joan of Arc should have escaped, and by this act of treachery the Maid was taken prisoner. She was tried and condemned, and it is with sorrow we have to write that the English burned her alive in the market-place at Rouen. Though she died by a death so cruel, she lives for all time as a great example of stainless heroism.

and he did so, piercing it through. But afterwards he caught the archduke's officer in an ambush, and slew him, as we read in the full story of William Tell that appears in our story pages.

How Arnold von Winkelried gave up his life for his country

After that the Swiss banded together, and would not obey the Austrians any more. But Switzerland really won its freedom at the battle of Sempach, where another great hero of the Swiss people gave his life for his country. A great host of Austrians came against the Swiss; and they were clad in stout armor with long spears and swords; but the Swiss were not protected by heavy mail. When the Swiss rushed upon them, they could not break through, but were thrust down and cut to pieces.

Then Arnold von Winkelried bade the Swiss draw together in the shape of a wedge or triangle, and follow him; and he ran upon the Austrians, stretching out his arms and dragging the spears together, so that all the points, as far as he could reach, were drawn together and pierced his own body, so that he fell and died. But in this way he made a space where there were no spear-points, and there the wedge of Swiss drove in, and so fought hand to hand with the Austrians and put them utterly to rout. After that the Austrians saw that it would be no use to try to force their rule upon the Swiss.

Another race of mountaineers found a heroic leader who won them freedom for a time. The Turks, who were followers of the religion of Mahomet, began to make conquest of lands in Europe just a little more than five hundred years ago.

How George Castriot held the Turks at bay for twenty-five years

On the western side of what afterwards became the Turkish Empire, there is a mountainous land called Albania. Here the conquering Turks made their way, and forced the lords of the land to submit to them, and they carried away the young son of one great lord, and brought him up in the faith of Mahomet.

The young man, who was called George Castriot, fought in the Turkish armies, and became skilled in war. Yet he had no wish to serve the Turks, though he bided his own time, and when he was nearly forty years old he, with a band of Albanian followers, suddenly left the Turkish army and seized a fortress called Croya. Having done this, he declared himself a Christian, and called upon the Albanians to rise and wage war upon the Turks.

The Albanians drove out the Turks, and took him for their leader, and because he showed himself so great a soldier, his Turkish name Scanderbeg has become illustrious forever. For though the Turks sent mighty armies against him, and were very great warriors, yet he overthrew them in battle many times, though they might have four or five times as many men as he. For twenty-five years he held the Turks at bay, so that they feared his name greatly; but after he died, the Albanians, lacking a leader, and getting no aid from other nations, were overcome by the Turks, and lost the freedom which Scanderbeg had won for them.

The Albanians were always restless under Turkish rule and caused the conquerors much trouble. Finally they joined the other Balkan people in 1912 and again won their independence.

Andreas Hofer, the brave innkeeper who fought Napoleon

Among the dominions of the Austrian emperor is a land called Tyrol, which borders upon Switzerland, and Napoleon caused the Austrian emperor to give Tyrol to the King of Bavaria, who was always ready to do his bidding. But when the Austrians went to war again with Napoleon, the Tyrolese rose up under Andreas Hofer, who was an innkeeper, and drove the French and the Bavarians out of Tyrol, though they themselves were only peasants. For a short time Hofer was made their ruler, as a loyal subject of the Austrian emperor, though he would not obey the Bavarian king and the Emperor of the French.

But the French armies defeated the Austrian armies, and the Tyrolese could not openly resist the power of Napoleon unaided. And then, though the brave Hofer hid among the mountains, a traitor was found who showed the French where he was. He, being taken prisoner, was tried like William Wallace and Joan of Arc, and was condemned and shot as a rebel. Yet the stand that Hofer made helped to give heart to the

TWO MEN WHO DIED FOR THEIR COUNTRY

When Edward I. was trying to conquer Scotland there appeared a young man named William Wallace, who when some English soldiers tried to rob him, turned on them and slew them. The English set a price on his head, and Wallace fled to the hills, gathered an army round him, and scattered the English soldiers at Stirling. Although the great lords of Scotland held aloof from him, as he was but a plain man, Wallace went on conquering, until a false knight betrayed him and King Edward put him to death.

When the Swiss were fighting against the Austrians, who would have taken away their freedom, there arose among the Swiss a hero, Arnold von Winkelried. The Austrians were ranged like a wall, in stout armor and with long spears, so that the Swiss could not break through them; but Winkelried bade the Swiss draw together in the shape of a triangle and follow him. He ran upon the Austrians, stretching out his arms, and dragging the spears together so that all the points he could reach pierced his body. He died, but he made a way through the Austrian ranks, and there the Swiss drove in and fought until the enemy was routed.

other nations of Europe to rise against the rule of Napoleon, and so in due time Napoleon was overthrown and the Tyrol was restored to its old freedom, for which Hofer had fought and died.

The sea-going people which won its liberty was the little state of Holland, where there are no mountains at all. In the days when good Queen Bess ruled in England, Holland and Belgium were ruled by King Philip of Spain, who tried to take away their freedom and to force them to give up the Protestant religion. He sent a merciless governor, the Duke of Alva, to Holland with great armies, and the Protestants suffered great persecution. The Prince of Orange, called William the Silent, one of the nobles of Holland, formed a league to drive out the Spaniards; and though the Roman Catholic part of Holland would not join him, he led the Protestants so that they utterly refused obedience to Philip.

How William the Silent was put to death by a Spanish plot

Yet, if the Dutchmen had been a little less sturdy, and William a little less resolute, they must have been crushed. They got some help from Queen Elizabeth, and a little from the French; but they owed far more to the skill and persistence of William than to anything else. Therefore Philip encouraged men, some of whom were merely scoundrels, though others were honest bigots who thought it right to kill by any means the man who fought so stoutly against the power of the Church of Rome, to murder William, and William, too, died for his country's freedom. After this the courage of the Dutchmen did not fail, but they went on fighting, and at last the power of Spain was broken, for there came open war between Spain and England, and England won, so that the Spaniards gave up trying to subdue the Dutch, and Holland became free.

Two other of our heroes lived not very long ago, for your fathers and mothers were born before either of them died. You know that Italy to-day is one of the great nations of Europe, and one of the men who helped most to make her so was Garibaldi. When he was born, Italy was made up of several states, some of which were subject to Austria, while the northern part was ruled by the King of Naples who was not an Italian.

Now, there were many people in Italy who wished to be free from foreign rulers, and there were some who dreamed that all Italy might become a free and united nation.

Garibaldi, the fisherman's son who made Italy a nation

So while Garibaldi was still a very young man, though he was already a skilful sailor, being a fisherman's son, he joined in a revolt against the rule of the Austrians. This was easily crushed, however, so that he had to flee to South America. There he took part in the wars which were going on, because the land was very unsettled, and he became famous as a leader, whose men were always ready to follow him to the death.

But after a time he returned to Italy, and joined in a fresh revolt, gathering men who were ready to fight, because Garibaldi filled them with his own great love of their cause. Yet they were still not strong enough to overthrow the Austrian rule, and again he had to go away to the United States. Yet again he returned, and once more the men of North Italy arose. This time they were victorious, and before long all Italy became one nation. And this was certainly in great part because of the power that Garibaldi had of filling those about him with his own courage and enthusiasm, even when their cause seemed hopeless.

Louis Kossuth, who fought for the freedom of Hungary

Last of all comes Louis Kossuth, who set himself to win freedom for Hungary from the rule of Austria, at the time when the Italians were seeking their own liberty. He was not a soldier, but a writer and orator, and a statesman; but the Hungarians made him their leader. They were defeated at the time, and Kossuth had to flee from the country; but later the Hungarians agreed to own the Emperor of Austria as their king if they could have certain rights of governing themselves; and this they owed, in the first place, to Kossuth. But Kossuth himself was not content with this. He would not own allegiance to Austria, and he died some years later, not in Hungary, but in Italy.

THE NEXT STORIES OF MEN AND WOMEN BEGIN ON PAGE 297.

Napoleon caused the Austrian emperor to give one of his mountain lands, called Tyrol, to the King of Bavaria. The people rose against this, and Andreas Hofer, an innkeeper, led the Tyrolese peasants against the French and the Bavarians. The peasants could not drive back the army of Napoleon, and Hofer hid among the mountains, where a traitor gave him up to the French. He was shot dead. But the stand he had made gave heart to other nations, so that they rose against Napoleon and overthrew him.

Italy is one of the nations of Europe to-day, but formerly Italy was made up of little states, under different rulers. The people revolted, and among them rose a fisherman's son, Joseph Garibaldi, who led them until all Italy became a nation, under King Victor Emmanuel, who is here greeting Garibaldi. Garibaldi is on the right.

THE PEASANT MAID OF ORLEANS TAKEN CAPTIVE BY THE ENGLISH

This picture should bring a thrill of pride to every boy and girl who looks at it. It is a picture of the Maid of Orleans, the selfless and stainless peasant maiden whose name is honored throughout the world. There came to her, as a young girl dwelling in her native village in France, voices and visions bidding her arise and save her country. And though men mocked at her at first, yet she went forth to deliver the land, and the King sent her, clad in white armor, at the head of a troop of horsemen to drive the English from Orleans. The English were scattered, and the victories of Joan of Arc gave new heart to France. But Joan was betrayed, and in this picture she is being led captive.

The town of Brescia, where Bayard died in defending a castle against the Spaniards.

THE MAN WHO KNEW NO FEAR

CONTINUED FROM P.72

TOWARDS the end of the fifteenth century there was a pretty sight to be seen one day before an old and noble castle in France, the Castle Bayard. The old Lord Bayard, who had been wounded in battle, stood leaning on his two sticks, with his beautiful wife at his side. He was surrounded by a great court of attendants. The eyes of the old warrior shone with affection and admiration. All the attendants were clapping their hands.

And the cause of their delight was a boy, fourteen years of age, who, dressed in silk and velvet, and with a feather in his cap, was making his little horse perform.

The wounded and crippled lord could not train his son for knighthood; so the little horse had been bought, the gorgeous dress had been made, and Pierre was going forth to learn the business of a soldier at the Court of the Duke of Savoy.

In this service the boy distinguished himself by his courage and skill, and gained the affection of everybody by his simple and generous disposition.

One day the Duke wanted to send a magnificent gift to the King of France, and it occurred to him that he should send this brave page.

So it came about that the French King was one day in the midst of his Court when Pierre, on his little horse, made his appearance, sitting so beautifully and making his horse obey so easily that it was a pleasure to watch.

"Piquey! Piquey! Spur again!" cried the King, clapping his hands. And all the Court cried, "Piquey! Piquey!"

So Pierre went cantering round the field again, and everybody shouted their praise of the boy's horsemanship.

We must hurry over all the brave things done by this fearless boy, for they would fill many volumes; and look upon another scene, when Pierre is a man. He is tall, straight, bright-eyed, and gracious. He has overthrown the bravest knights; he has won the highest honors on the most desperate battlefields; his name has become a wonder to all mankind. He is called "the knight without fear and without reproach." Everybody has heard of him; everybody knows how dauntless is his courage, how generous he is to fallen foes, how chivalrous to women, how brave a knight, how noble a Christian.

And now this is the scene. A great battle has been fought, and the new King of France, a mere boy, is riding out of his first fight, flushed with the pride of victory. One thing he desires: to be knighted. This great King longs to be created a brave knight. But who can do it? Is not he himself the Power who creates knights?

Well, that evening, before the King's tent, a wondrous sight was seen. The bravest soldiers of France made a great square before the tent, flags were flying, and the heralds blew their trumpets. Those who were to receive honor at the King's hands gathered in front, full of excitement. Everybody was waiting with pleasure for the ceremony. Then from his tent came the King. He walked to where Bayard stood, knelt on the grass before him, and Bayard, laying a sword upon the King's shoulder, created Francis I. a knight. The King had chosen the bravest and most courteous knight to raise him to the honor of knighthood.

One of the great exploits of this splendid Bayard was to defend a castle at Brescia against an overwhelming body of troops. When the Queen of those troops asked her general angrily how it was he could not take, with all his men and guns, "a crazy pigeon-house," the general answered, "Because, madam, there was an eagle in it."

That was Bayard's character in war; an eagle. He feared to meet no foe. He rode like a whirlwind to succor the weak. He crushed the power of tyrants. But in peace he was gentle. In war, an eagle; in peace, a dove.

Bayard met his death, which was worthy of his whole life, while with a handful of men he was holding back the Spaniards from pursuing the French Army, which was retreating from a difficult position. During the fight he was struck by a ball. His sorrowing companions lifted him from his horse, and propping him against a tree tried to aid him. But, feeling that he was mortally wounded, he raised the cross of his sword-hilt to his lips and breathed a prayer. Then he bade his followers turn his face to the foe, and, leaving him there, themselves ride on to safety. We need not say that his friends refused to leave him to die alone, but stayed beside him until he breathed his last.

THE DEATH OF BAYARD, AFTER HOLDING THE SPANISH IN CHECK WITH A HANDFUL OF MEN

"PARTNERS"

"COME, cheer up, Dannie, old chap." Little Mackie seated himself upon the side of his comrade's cot, and, laying down his crutches, anxiously viewed the tousled head buried face downwards in the pillow. "Of course it's hard luck that you have to stay in bed all the time when we other chaps can go hopping round, chipper as you please." Mackie glanced at his crutches radiantly. "But then you know," he continued, "the doctor said you could sit up by and by. Then you and me'll go into partnership." A pale cheek emerged partially from the pillow. "I'll be a bootblack on the Square; we'll be partners and go halvers in the profits."

"But what can I do?" came a small voice with awakening signs of interest.

"Oh, you'll be lots better by that time and you can sit in a wheel-chair behind a little stand and sell candy."

"That'll be nice," Dannie sighed, contentedly.

"Of course, it'll be nice," returned Mackie confidently, "and don't forget, we'll be partners."

That night when the lights had been turned down and the two little fellows lay side by side in the small white cots in the hospital ward, a great noise and scurrying through the halls was heard suddenly. Several of the children sat up excitedly and inquired what was the matter; but their nurse told them it was nothing.

Little Mackie lay back on his pillow and listened attentively to the queer noises in the halls.

"Hey, Dannie, partner," he ventured at last in a whisper. "Nurse says there's no danger, but if there is, don't you be scared. I'll look after you."

Suddenly the noise grew louder, and a wild cry rang through the corridors of "Fire! Fire!" Then three firemen rushed into the ward and caught up the nurse and as many children as they could carry under their arms, and disappeared.

Mackie and Dannie were left alone in the ward. They could hear the snapping and crackling of the flames and presently the smoke came pouring in through the door in great puffs. It made their eyes water and throats tingle, and though both were brave little fellows, their hearts began to beat very quickly.

"Mackie!" cried Dannie, excitedly struggling to sit up. Run! Run! Don't wait for me! They mayn't come back!"

Mackie climbed out of his cot and hobbled over to his chum's bed.

"Quick, Dannie," he whispered hoarsely. "Put your arms around my neck. Now hold on tight. That's right. Now we'll go."

Tap! Tap! Tap! through the smothering smoke the brave little fellow made his way, Dannie hanging to him, his arms tightly clasped about his neck.

Meanwhile, outside the hospital, an excited crowd watched the firemen carry out the children.

"Are they all out?" anxiously inquired one of the managers of the hospital, who had rushed to the scene.

"No, not all," the man half gasped. "There were two little chaps in the lower ward — but I am afraid the flames have cut them off."

"We must save them!" said the manager. "Can't something be done?"

As the fireman started back to the flame-wrapped building, word spread through the crowd that there were still two children in the building, and a wild, hysterical wail went up, as tongues of fire began to shoot out of the windows.

"God save the poor mites," a woman sobbed, "God save them!"

And He did, for through the confusion of noises came the sound of two crutches tap-tapping on the marble floor. Then Mackie staggered out of the doorway with little Dannie still hanging about his neck. Amid the shouts of the multitude, the two were borne to a place of safety, but Mackie had fainted. When he opened his eyes, kind faces were bending over him.

"Where's Dannie?" he whispered hoarsely.

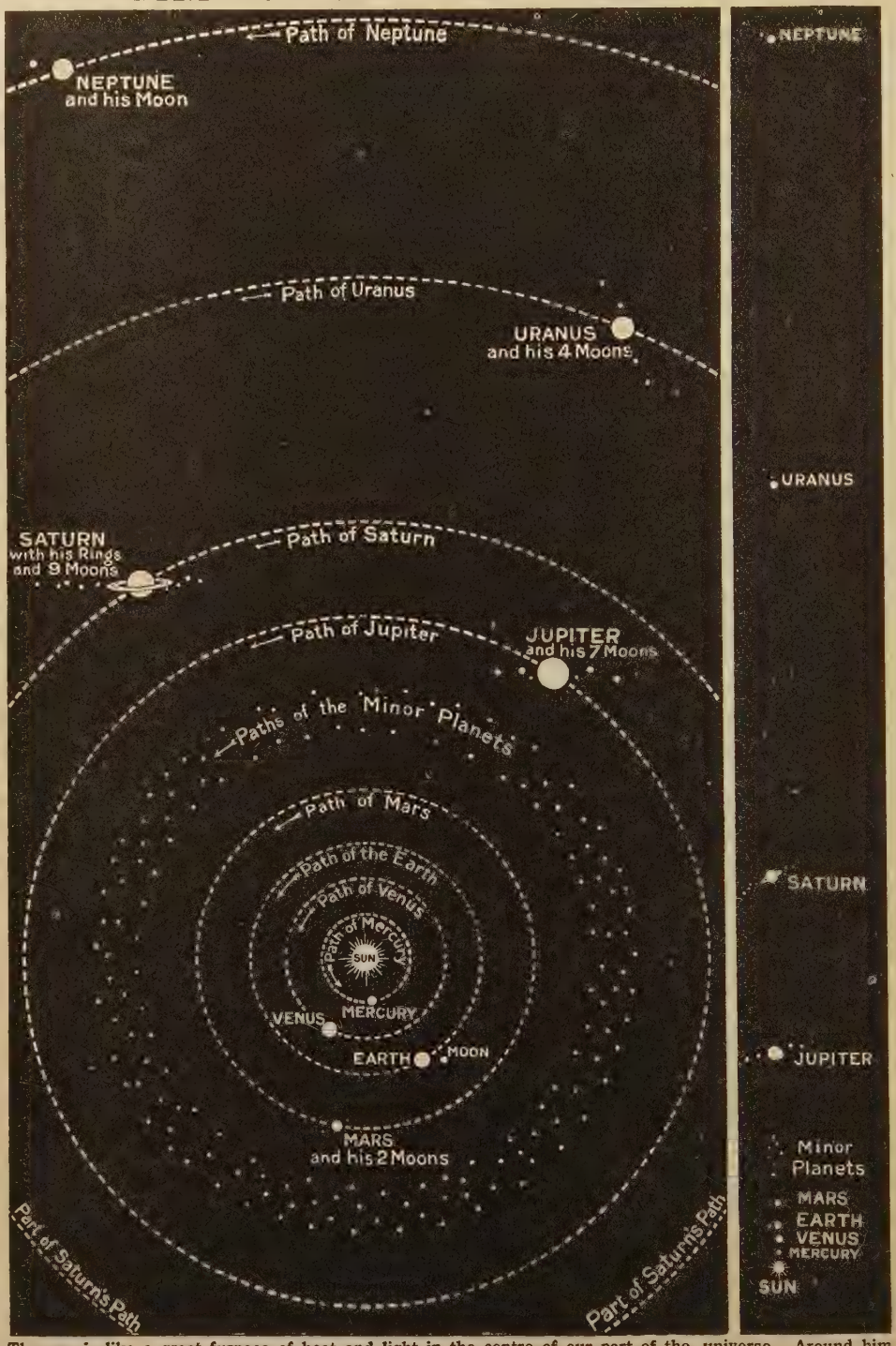
"Quite safe," they reassured him, gently.

Mackie turned over in his bed with a little sigh of deep content. "Me and Dannie are—part—ners," he whispered sleepily as he cuddled down between the cool sheets. Hours later he awoke to find his partner in the next bed.

"Say, Mackie," he cried, "the fire whispered something — it was peanuts, I think!"

THE NEXT GOLDEN DEEDS ARE ON PAGE 257.

THE SUN AND HIS CHILDREN



The sun is like a great furnace of heat and light in the centre of our part of the universe. Around him travel for ever a wonderful family of worlds, which we call planets. They all go round the sun in the same way, but some are so far away that it takes them many years to go round him. The earth goes round the sun once in a year, but Neptune, the most distant planet, goes round only six times in 1,000 years. The picture at the right shows the size of the planets compared with one another, and their distance from the sun.

WHAT THIS STORY TELLS US

WE know the earth spins through space like a ball, spinning round once in a day and traveling round the sun once in a year. But the earth was not always a great ball. Once it was a great cloud, made of the stuff of which the earth is made, and of which our bodies are made. The cloud was moving, spinning round until it came together, shrinking into the shape of a globe, and at last becoming solid. Spinning in space at the same time were other great clouds. We call them planets, which means wanderers, because they wander through the sky. They are the sun's family. One is so near to the sun that it goes round it in 88 days; one is so far away that it has only been round the sun 12 times since Jesus Christ was born. All round these planets are other worlds called moons, and millions of strange and wonderful things which go through the universe spinning.

THE SUN AND HIS FAMILY

CONTINUED FROM P. 88

NOW we must take up the story of the earth from the beginning. As we know that the earth is not in the middle of the world, but that it goes round the sun, we must be very sure to find out all that we can as to what the sun is, and why it makes the earth go round it. We could not live without the sun, and we cannot know too much about it. Where, then, have the sun and the earth come from, and what were they like at first?

We have seen that, as the earth spins round itself, it moves round the sun, and so we know that, so to speak, the sun is a neighbor of ours. Now we must find out whether we have any other near neighbors, and we find that we have. There is, for instance, the wonderful moon, the story of which is part of the story of the earth. But also we see in the sky a number of bright objects that look like stars, but which, for several reasons, we know are different from the stars, that we also see when we look upwards. These bright objects are not stars because, for one thing, they move about the sky, while the real stars seem to be fixed, and for ages past have been called the "fixed stars." Since they are always seen to be moving, the men of long ago called them the wanderers; but, of course, those men did not speak English, but Greek, and we now use the Greek word when we speak of them. They are called *planets*, which just means wanderers.

Now, of course, when we talk of wandering we think of a movement that is haphazard and does not quite know where it is going. That is not true of the planets, even though we call them wanderers. We know now that these planets all move round the sun just as the earth moves round the sun, and in just as orderly a way. That is why we may talk of the sun and his family. We must think of the sun as a great light and furnace in the centre of our part of the great world.

Around him travel, from one year's end to another, a wonderful family of planets. One of these is the earth. She is not the biggest, nor the smallest, nor the nearest to the sun, nor the furthest from it. They all go round the sun in the same direction—they go the same way; but, of course, if a planet is further away from the sun than the earth is, it will have much further to go before it can get right round the sun and come back again to the same place. This takes it a very much longer time, and so "from one year's end to another" would mean something very different on that planet from what it means to us. Our earth may go round the sun more than a hundred times whilst one of these other planets that is much further away from the sun goes round only once.

But all that does not matter at

present. The great fact is that our earth, which is so important for us, is really just one of several planets that go round the sun. It is our sun and their sun. Now, the Latin word for the sun is *Sol*, and so this great system, made up of *Sol*—the sun—and all his planets is called the *solar system*. Plainly then, we shall not be able to tell the story of the earth unless we know the story of the solar system, for the earth is part of the solar system.

THE TIME WHEN THERE WAS NEITHER EARTH NOR SUN

You will remember that men used to think that the earth was flat and still, with the sky above it, and the fiery under-world below it? How different that is from what we know now - - that the earth is a ball, one of a number of balls that are always flying round the sun!

Now at last we can begin at the beginning of the story of the earth. We must go back to a time when there was no earth at all, when there was no sun at all, and no planets at all.

There was only, in those far-away times—we cannot say those far-away *days*, for there could be no days when there was no sun or earth — there was only in those far-away times a great cloud of stuff, so much bigger than any cloud you ever saw, so much bigger than anything we know, that not even the wisest of wise men can really make a picture in his mind of how big that cloud must have been. There it was, however. Enormous though it was, it was only a cloud. If we could have been there to see it we should not have found much to say of it, except simply that it was there and that it was very big. All parts of it were like all other parts. It was just a cloud, and if you had tried to draw a map of it you could only have drawn its edge all around, for there was nothing else to draw in it.

THE STUFF OF WHICH WE ARE MADE WAS IN THE GREAT CLOUD

Some people think that it must have been a very bright and even a very hot cloud, giving out light and heat from itself; but most people think that this was not so, and that at first, at any rate, this cloud was not bright or hot, but perhaps very cold.

Now, I suppose you guess what is coming. That great cloud was made of the stuff which now makes up the sun and the planets, including our own earth, and even the stuff of which your body is now made, and the stuff which is before you and which you call paper. All the stuff, or matter, as it is called, that now goes to make the solar system—the sun and his family—was there in that great cloud. There was no system, however. The cloud had no particular shape, and one part of it was just like another.

There was only this to be said—if *we*, and not merely the stuff of which our bodies are made, had been there to say it—and that is that all the little bits of which the cloud was made up were moving. They were probably rushing about in a very rough-and-tumble sort of way. Nothing could have been less like a system of any kind. This all happened so long ago that we simply cannot think how long ago it was, any more than we can really think how big the cloud was. But, as the ages went on, all the little bits of stuff that made up the cloud found themselves moving, not like a jumble, but in a more orderly way. Indeed, so orderly was their movement, after a long time, that the whole great shapeless cloud slowly began to twist or spin on itself.

WHEN THE SPINNING OF THE EARTH BEGAN

Now, that reminds you of the earth spinning on itself, and so it should, for the slow spinning of this great cloud was the beginning of the spinning that makes our night and day. The stuff that makes the earth was set spinning in that cloud, and it has been spinning ever since; it is spinning now, and in the same direction as when it first began. But there was no earth yet, nor sun, nor solar system; there was merely this spinning cloud.

As time went on it began to shrink. This we can be quite sure of, for we know that every speck of stuff in the whole world tries to attract every other speck of stuff in the world. That is why a ball falls to the earth when you let it go, as we shall see later. Now, if in this enormous cloud all the little parts were pulling upon each other, of course it would shrink, for those on the outside would have all the others pulling them inwards and none pulling them outwards.

We have made up our minds to try to find out where the sun and the earth come from, and what they were like at first. But before we do that we must look for a little while at what we may call the brothers and sisters of the earth

THE FIRE THAT FLIES THROUGH SPACE

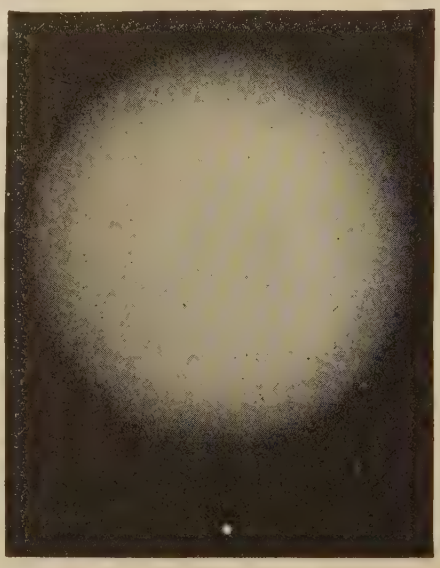
We may often see lights like these shoot across the sky in November, and this is why we call them shooting stars, but they are not stars. They are very little things, no larger than base-balls, which the earth has caught as she flies through space, and sends spinning through the air so fast that they are made hot and bright by their flight. Once a comet, a star with a tail of fire, disappeared, and in its place are now many of these flying lights, which we call "meteorites," after a Greek word meaning something raised high above the ground. The missing comet has broken into pieces which have become meteorites. We see them best in November because then the earth is in the path taken by many of these little wanderers.

—heavenly bodies that began as the earth began, and that depend upon the sun in the same way. These heavenly bodies, together with the sun and the earth, make up a little family which is complete in itself, and is, in a way, independent of the rest of the universe. This little family, since its centre is the sun, the Latin name for which is *Sol*, is known as the solar system. What, then, are the other bodies, not unlike the earth, that go to make up the family of the sun?

Ages and ages ago, men who watched the face of the heavens found that amongst the stars there were some few which behaved quite differently from the rest. All the heavenly bodies, of course, seem to rise in the east and set in the west; but that, as we have seen, is simply because the earth, from which we behold them, is twisting round the other way. Apart from that movement, which is only apparent and not a real movement, men found that all the heavenly bodies except a very few were fixed in their positions. If we take, for instance, the stars that make up what the ancients called the "Great Bear"—part of which we often call the "Dipper"—we find that, year after year, they are always found in the same position. The brightest of the stars had their place in the heavens noted thousands of years ago, and, so far as we can tell without very careful study, they occupy just the same places now. We have lately learnt that really they are moving, but they are so far away that, to the ordinary eye, nothing can be noticed even in the course of many years. These stars, then—that is to say, all the stars except a very few—were called *fixed stars*.

On the other hand, one or two bright stars could be seen, including even the brightest of all the stars, that were quite different in the way they behaved. They were not fixed, but moving, and their movement could be seen quite easily from day to day or week to week. In one month you might see one of these very bright stars seeming to lie right inside the "Great Bear" or the "Dipper," but in another month it would not be there at all. Therefore, a special name was given to these stars which moved or wandered about the heavens, and which were, therefore, so very different from the fixed stars. They were called *planets*, which is simply the Greek word meaning "wanderers." Amongst them was, for instance, the morning star, or Venus, which outshines all the fixed stars; another was Jupiter; and another, because of its reddish color, was named after Mars, the god of war.

HOW THE EARTH HAS SHRUNK INTO ITSELF



The earth was once a cloud moving in space, made of the stuff of which the earth is made, and as it spun round, the great cloud began to twist or spin on itself. It became like a globe, as in the top of this picture, and shrank until it became the solid earth on which we live, represented by the dot in the picture.

It was a very difficult matter for the old students of the heavens to explain the movements of these planets, or wanderers, and all sorts of curious ideas were suggested, but none of them quite met the case. The truth was, of course, that the old students were without the key to the whole difficulty. We know now that these planets are quite different in every way from the fixed stars, and that from age to age they go on circling round the sun just as the earth does. The planets are not stars at all; compared with the fixed stars they are much smaller than a pin's head compared with the dome of the national Capitol. They are so bright simply because they are so near us. All of them put together and added to one of the fixed stars would make no difference that could be noticed at all. More than that, they do not even shine by light of their own, but only by the light of the sun, which strikes upon them, and then is thrown back to us

upon the earth, just as a ball is thrown back from a wall. Those planets owe all their light to the sun, and if we were upon one of them we should see the earth shining in the sky very brightly and behaving like a planet. Indeed, the earth is one of the planets, and shines by sunlight just as they do. Not only so, but the earth is, in addition, one of the smallest of them.

All the planets, then, including the earth, circle round the sun and make up the family which we call the solar system. This solar system is very much alone in the great world. The very nearest of the fixed stars is so far away that the light by which we see it has actually taken three years to reach us, and light travels so fast that it would go eight times round the entire earth in a second. One of the most wonderful things that we have found out lately is that the solar system is so much alone in the world, so far from everything else.

HOW THE MOON GOES ROUND THE SUN

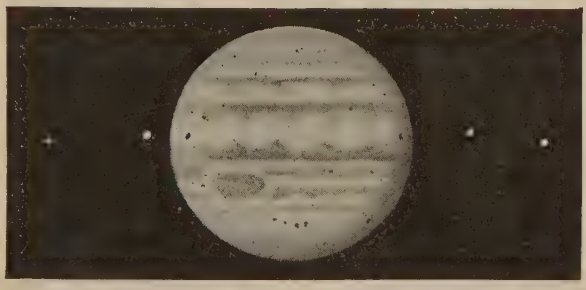
The moon, like the earth, goes round the sun, but instead of going straight round as the earth does, the moon circles round the earth as shown here

All these planets move round the sun, but some of them are much nearer to him than others are. Two of them, we know for certain, are nearer the sun than the earth is. All the rest move round the sun at distances greater than that of the earth.

Now what about the moon, you will say. Well, there is no doubt at all that the moon goes round the earth just as the earth goes round the sun. So, of course, the moon goes round the sun, too, only instead of going straight round as the earth does, it has to keep on circling round the earth all the way. The moon, then, is part of the solar system. Then we have to ask ourselves whether any of the other planets have moons, and the answer is that they have, so that all these moons must also be included in the solar system.

It is not very long ago since the first of these moons were found. They were seen by the great Italian named Galileo, and were almost the first reward he had for inventing the telescope—the tube with glasses in it through which men look at the sky. Galileo looked at the great planet called Jupiter, the biggest of all the planets, and there, with the help of his telescope, he saw what no one had ever seen till then—four tiny moons. As he watched them from night to night, he could see quite plainly that they were going round Jupiter, just as the moon goes round the earth. Sometimes one of them would disappear altogether because it had got behind Jupiter, and then it would turn up again on the other side from where it was last seen. These moons went round Jupiter at different distances from him, just as the planets go round the sun at different distances from him; but they all went round in the same direction.

THE TINY MOONS GALILEO SAW THROUGH HIS TELESCOPE



Seven worlds besides ours are for ever circling round the sun, and round them circle many moons. Two of these worlds, which we call planets, have nine moons circling round them. Jupiter's moons were almost the first discoveries made through the telescope, and this picture shows the four moons which were first seen by Galileo.

The moons of Jupiter will always be specially interesting, not only because they were the first to be found, but also because they gave Galileo a good argument. He was trying to persuade people to believe that the earth and the other planets go round the sun, and it was of great assistance to him to be able to say that Jupiter, like the earth, had little moons that went round him on his way.

THE CLOUD OF WHICH THE EARTH IS MADE

The earth began, as far as we know, in a great shapeless cloud. All the matter of which the sun and his family of worlds are made was in this cloud, which moved through space for millions of years, until parts broke away. The parts shrunk into themselves and became globes, like the earth and the moon opposite.

THE EARTH AND THE MOON IN SPACE

This shows what the earth and the moon are like to-day. As the cloud opposite broke into pieces, the separate parts began to shrink, and one part became the earth. Every speck of stuff in the world tries to draw every other speck of stuff in the world, and the stuff in the centre of the cloud drew to it the stuff on the outside of the cloud. Slowly the cloud grew smaller, shrinking until it became the solid earth, and part of it broke away and formed the moon. The moon should be much farther from the earth than is shown here; to show them at their proper distance we could only have made them the size shown at the bottom.

Since that time moons have been discovered going round many of the other planets. So all these moons must be included in the sun's family. The two planets that are nearest the sun have no moons; then comes the earth, which, as we know, has one moon. Some of the planets which go round the sun at a greater distance than the earth are better off. The wonderful planet called Saturn, for instance, has nine moons, and five more moons of Jupiter have been discovered since Galileo's time, so that he is pretty well off with nine. The last three of these were only found in this century, and it is quite possible that there may be more.

THE WORLDS THAT FLY ROUND AND ROUND THE SUN

Now, I think, it will be useful for us to have a list of the planets that make up the solar system, and we shall name them in the order of their distance from the sun. Also we shall put opposite each planet three facts concerning it: first, its distance from the sun in miles; second, the time that it takes to go round the sun; and third, the number of its moons.

Names of Planets.	Miles from the Sun.	Length of its Year.	No. of Moons.
Mercury .	36,000,000	88 days	0
Venus .	67,000,000	224 days	0
Earth .	93,000,000	365¼ days	1
Mars . .	142,000,000	686 days	2
Jupiter .	483,000,000	12 years	9
Saturn .	886,000,000	29½ years	9
Uranus .	1,782,000,000	83 years	4
Neptune .	2,792,000,000	165 years	1

If you look at the second column you will see that we have called it "length of year." Now, you understand that what we mean by that is the length of time the planet takes to go right round the sun, and we measure that by the measures that we on the earth know best. So, when we say that the length of Neptune's year is one hundred and sixty-five years, what we mean is simply that whilst Neptune goes round the sun once the earth has gone round him one hundred and sixty-five times. If we had made a mark at the place where Neptune was in the year 1751, he would just have got back to it in 1916. That is a long year, is it not?

HUNDREDS OF TINY PLANETS AND "STARS" WITH TAILS OF FIRE

But even this is not the whole of the sun's family, for we have lately found some very tiny little planets, far smaller than the moon, which go round the sun between Mars and Jupiter. All of them put together—and they are numbered by hundreds—would not be nearly as large as the earth. At one time it used to be thought that all these tiny little bodies had been formed by the breaking up of some big planet; but nowadays men are very far from sure that this "shattered planet" ever existed. However, all these little bodies have to be included amongst the sun's family. They are all found, be it remembered, in one particular part of the solar system, and there is no doubt that if we could discover the history of any one of them, it would also be the history of all the others.

Yet, again, the solar system includes a number of strange and wonderful objects which are utterly different from any of those we have described up to the present; they are called *comets*, from the Greek word for hair, because when we can see them best they seem to have long, hairy tails streaming out across the sky behind them. These also travel round the sun, and therefore belong to his family; but they do so in a very curious way. None of the planets go round the sun in circles but always in paths that are shaped like a circle that has been rather flattened in one direction.

THE BRIGHT LIGHTS THAT SHOOT ACROSS THE SKY

In the case of the comets, however, this flattening is very extreme, so that the path of a comet would be something like the picture on page 149. At one time in its history the comet is quite close to the sun, and just misses running into him. Then, after passing round the sun, it travels away from him, out and out, cutting across the paths of all the planets and passing millions of miles beyond even Neptune, and then at last it will turn on its course and come back again. But still it is one of the members of the sun's family.

Now, even this is not quite all. You must have heard of what are called shooting stars, and on any clear night in November you will very likely see some —and also at other times of the year. A flash of light seems to come from no-

where, dart for a little distance across the sky, and then disappear. These, of course, are not stars at all, but quite small things, perhaps the size of a tennis-ball, which the earth has caught as she flies through space, and which, as they pass through the air, are made very hot and bright. What is left of them may often reach the earth, and many of them are to be found in museums nowadays. It seems that throughout the solar system there are countless numbers of these small objects called meteors, from the Greek word meaning raised high, some, perhaps, no bigger than grains of sand, others as big as bullets, pebbles, cricket-balls, and sometimes a good deal larger. These meteors also circle round the sun and belong to his family. In November the earth is apt, in her path, to cut across the path taken by a very large number of these tiny wandering bodies, and that is why we most often see shooting stars in the month of November.

A very interesting fact is that a famous comet, the path of which was well known, disappeared some time ago, and just in that same path we now know that there are a number of these small bodies like pebbles. There can be little doubt that they are the remains of the broken comet.

Now we have completed the strange list of the different kinds of things that make up the solar system: Sol, the sun himself, in the centre, the planets round him, the moons of the planets going round them, the very small planets found between Mars and Jupiter, the comets, and a host of little things like pebbles. All these make up one great family ruled by the sun.

POLE STAR & "DIPPER"

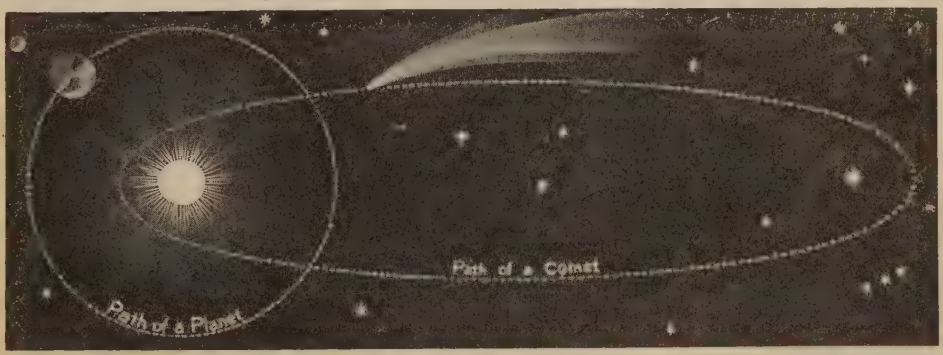
All stars move, but some so slowly that they are called fixed. Those forming the "dipper" are fixed. This picture will help you to find them in the sky. The top star is the bright Pole star.

So far as great astronomers have been able to find out up to the present, they practically all move in the same direction round the sun; they twirl or twist on themselves as the earth does, also in that same direction; their moons go round them in that same direction, and even the sun himself is twisting in the same direction also.

This solar system, of which, of course, from our point of view, the most important parts are the sun and the earth, is very much alone in the great world, as we have already mentioned. But it does not stay in one place. We know that the sun—and with him all the planets and moons — is moving through space at a great rate of about twelve miles per second. Though the solar system is very much alone in space now, we have no reason to think that it was always so, or that it will always be so.

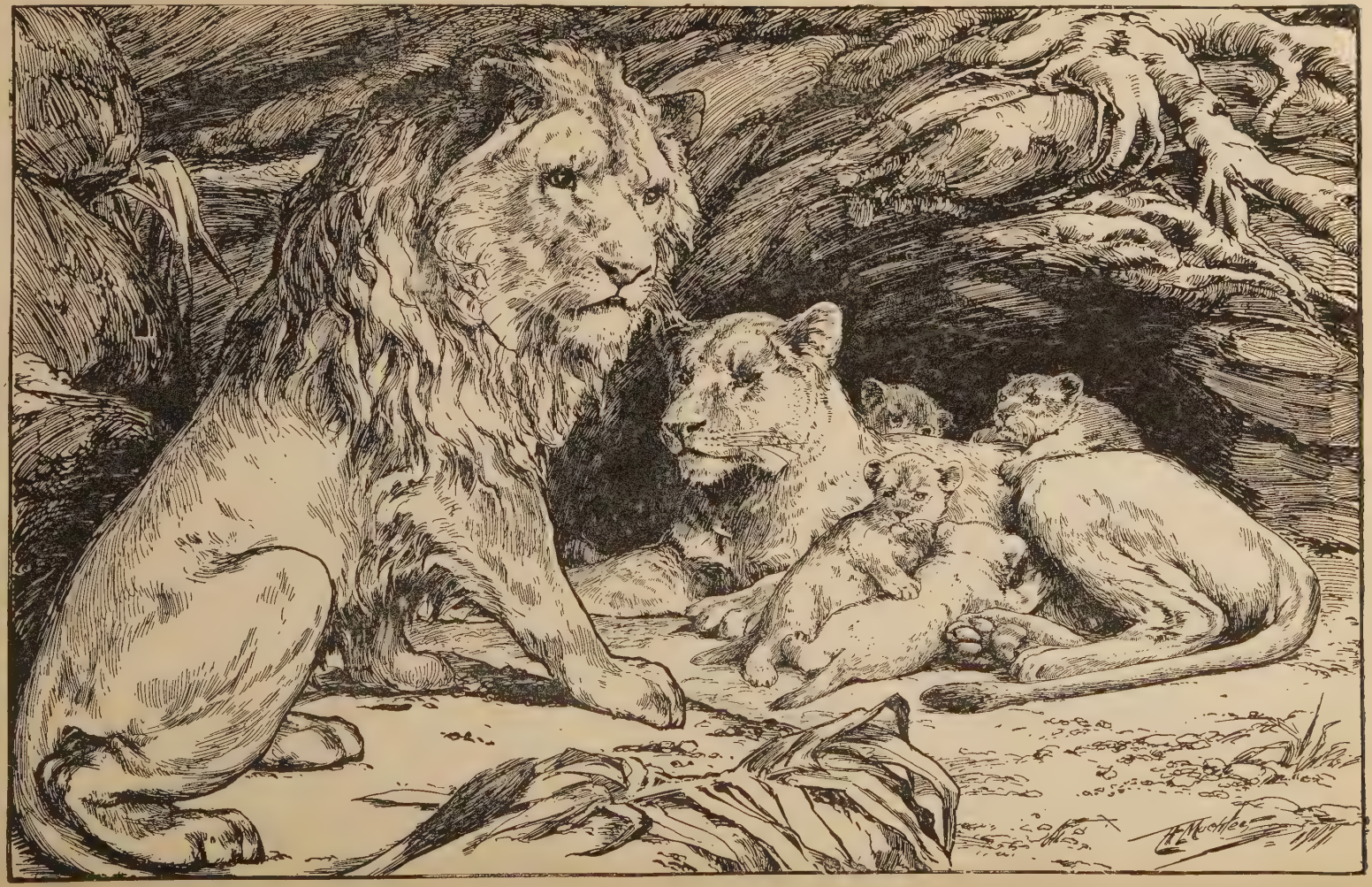
THE NEXT STORY OF THE EARTH IS ON PAGE 321

THE LONG AND LONELY JOURNEY OF A COMET, WITH ITS TAIL MILLIONS OF MILES LONG



This picture shows the path of a comet round the sun. At one time the comet comes quite close to the sun, and just misses running into it; then, passing round the sun, it travels far beyond all the planets, millions of miles into space, until it comes to the sun again. The dotted circle shows the path the earth takes round the sun, and it is when a comet comes close to the earth's path that we are able to see it.

THE KING OF THE ANIMAL WORLD: A LION AND LIONESS WITH THEIR YOUNG



THE ANIMALS WE READ ABOUT

THIS story tells us of the life of the wild animals, and what happens in those parts of the world where the lion and the tiger still roam about and animals are the enemies of man. There are few dangerous wild animals in this country, but there are still parts of the world where the lion is king and where its roar is terrible in the forest. Slowly, however, man has conquered the animal kingdom, and the great fight between animals and men ends always, and must end always, with the triumph of man. But we learn here that these animals are not useless in the world, for nothing ever created is quite useless, and the world could not spare even its wild animals.

ANIMALS THAT WORK FOR NATURE

LION	JAGUAR	LYNX	FERRET	SABLE	WOLF	WILD DOG
TIGER	PUMA	POLECAT	CIVET	MONGOOSE	FOX	JACKAL
LEOPARD	CHEETAH	WEASEL	PINE MARTEN	BEARS	BADGER	HYENA

CONTINUED FROM 57

THE best idea of peace in the world is that which we fancy we see when reading of the days to come, when the lion shall lie down with the lamb, and a child shall lead them. We know that, if a lamb lay down near a lion to-day, the lion would quickly eat it. The lion seems, therefore, a cruel creature. But the lion is doing only what it was intended by Nature to do. Suppose there had been no lions, or tigers, or leopards, or other flesh-eating beasts in wild countries. There would have been all kinds of deer and cattle, sheep and goats, hares and rabbits, and other animals which live upon vegetable matter. There would have been nothing to keep their numbers in check. They would have multiplied to such an extent that the countries in which they lived could never have become the homes of men.

Nature never meant that any class of animals should become too numerous, because that brings trouble all round. It is said that the countries lying near the Mediterranean Sea lost their forests and vineyards through goats being allowed to work havoc. The goats, having no enemies to keep down their numbers, ate up everything they could. They gnawed the vines, they nibbled off the young shoots of trees; they ate the bark of the big trees and so killed them. They destroyed all the green growth upon the mountain-sides, and left a wilderness in place of smiling plenty. By so doing they caused the climate to become changed into one dry and unfavourable to the growth of green things. Where there are forests and green plains the air is never so hot and dry as where all is bare rock and sand. By destroying forests we ruin the climate.

Had the deer and cattle and sheep and goats all been allowed to increase as the goats in the Mediterranean countries were, there would have been far greater damage. The end of it would have been that these animals would have died of starvation, for they would have changed the beautiful places in which they lived into dreary deserts, where nothing would have been able to grow.

If the numbers of lions and tigers and other savage creatures had been allowed to increase without any check, these would in turn have become a deadly peril to us all. But man has become master of the lions and tigers. He is not so strong as these monsters, but he is more clever, and has made spears and guns with which he can kill them. Wherever the white man makes his

home, the lion and the tiger have to leave. There is no need now for lions and tigers to keep down the number of other wild creatures that eat herbs, for man can do that himself. He does not want big animals which kill his cattle as freely as they kill the creatures of the forest.

WHEN THE LION CREEPS ABROAD IN THE NIGHT

The story of the war between men and the savage beasts is as old as the history of men in the world; but victory always rests in the end with the man. To-day, in India, lions have become so scarce that nobody is allowed to hunt them; they are looked after and protected almost as deer are protected in this country.

There are lions in other parts of Asia as well as India, but Africa is now the chief home of the lion. Where white men have been living for a long time it is not very often seen, but when men are making their way into new parts, there the lion is a terrible enemy to them. The deer flee away at the sight of man, and the lion, unless he follows the deer, must have cattle, or even men, or else he must starve. So he attacks the horses, and mules, and cattle which draw the white men's wagons, and even kills and eats the men themselves. He comes out of his home at night, and, creeping very quietly up to his prey, springs with great force upon it, and kills it with his great strong teeth and paws. He can carry away a young ox as easily as a cat can carry away a rat. The teeth of the lion are of huge size, and its jaws are as strong as a great steel-trap. How does it get the great power which enables it to kill a horse or an ox at a single blow?

THE THREE STRONGEST THINGS IN THE ANIMAL WORLD

Let us fancy that we are looking at those terrible front paws with which it strikes the blow. The leg, or forearm, as it is called, measures 19 inches round, and is made up of the hardest of hard bone, with muscle and tendons as strong as the strongest wire. The foot measures 8 inches across. When this foot strikes an animal the lion shoots out its terrible claws, which are hidden, when it walks, inside the joints of the toes. These claws are like great hooks made of yellow horn. They tear the flesh off an animal as we should strip the peel from an orange. The force with which these claws are driven in is almost more than we can believe. We are told that the three strongest things in the animal world are these: (1) the blow from the tail of a whale, (2) the kick of a giraffe, and (3) the blow from a lion's paw. The forearm of the lion is worked by great muscles at the shoulder, and the blow which it makes is really like the blow from a steam-hammer. No wonder that it can kill a man or a big animal with ease.

The lion and the tiger are the largest of the cat family. They are really great fierce cats. Your pet kitten is simply a young lion or tiger on a tiny scale. Notice the kitten's claws: they are made in the same way as the lion's. Notice how rough its tongue is upon your hand. The lion's tongue is like that, only much more rough. On its tongue little hard points, like fragments of horn, stick up, so that with these the lion can tear pieces of meat from a bone just as if it were using a file.

THE LION'S ROAR IN THE FOREST AND HOW HE GETS HIS SUPPER

Another thing in which the lion is like the cat is that it cannot run fast for a long distance. It can spring a long way, and it can bound along at a great rate for a short time; but, just as a dog can race a cat, so a deer can easily race a lion. So the lion has to be very cunning to catch swift animals for its supper.

When a lion goes out at night, he is fond of making a great noise, as though boasting of his strength and shouting defiance. He puts his mouth to the ground and roars. There is no other sound in the animal world like the roar of a lion; it is so loud, so deep, and so powerful! He goes to a pool, takes a deep drink, and then, if he is not very hungry, goes off roaring again. If he is hungry, however, he keeps quiet. He knows that other animals of the region will be coming to drink, and so he lurks nearby until one comes stealing through the darkness, when he leaps upon it. That is one of his ways of catching a supper. There is another way.

Suppose that there are deer right out on the plain. It is of no use for the lion to go galloping out there, for the deer would see him and rush far away. There may be scattered rocks to enable him silently to creep from one to another, and so get near, ready to jump out. But

The lion is the king of beasts, the lord of the forest. A blow from a lion's paw is one of the strongest things in the world, like a blow from a steam-hammer. When he goes to drink at the pool at night, he puts his great mouth to the ground and roars, filling the other animals with terror, and sending them rushing madly to and fro until one dashes straight into the lion's mouth. That is how the lion gets his supper.

The tiger, which belongs to the same family as the lion and the cat, has not the grand head and mane of the lion, but it uses its strength just as surely as the lion, and in such countries as India hundreds of people and thousands of cattle are killed by tigers every year. When they have once tasted human blood, tigers become very bold, and will prowl round houses at night and carry off any living thing they can catch.

The jackal runs like a shadow after the lion and tiger, and picks up whatever they leave. He will eat anything the lion and tiger leave lying about.

The fox is the only wild animal left in England which is at all like the wolf. It is handsome, cunning, and bold, and destroys the farmer's fowls and ducks

This picture shows us a pack of wolves hunting for food. They hunt together in large numbers, and when the ground is under snow and food is hard to find, they run for miles, chasing horses and men. Sometimes the driver has to let loose a horse to satisfy the wolves and enable him to get away with the others.

suppose that there are no rocks; then he cannot get near. In that case two lions have to hunt together. One lies down and hides. The other lion goes quietly off in the reeds and bushes at the edge of the plain, until he can get round to the back of where the deer are feeding; then he dashes out with a roar. The deer rush away in terror, with the lion after them. Though he cannot keep up with them, he can keep near enough to drive them towards where the other lion is hiding. In an instant, when the deer draw near, this lion bounds forth, strikes right and left with his great paws, and at each stroke he kills a deer, and so gains a supper for himself and his friends.

A LION THAT SAVED THE LIFE OF A MAN

When caught young, lions can easily be trained and taught to do tricks with their trainers. We often see them do this in menageries and circuses, where men are foolish enough to risk their lives to perform with wild beasts. But though the lions will do as their trainer wishes, they would kill anybody else who went into their den. A terrible thing happened in Paris a few years ago through a stranger going into a den of lions. A man had to perform with nineteen lions. Six of them he himself had trained, but the other thirteen, although they had been trained, did not know him. The moment he set his foot inside the great cage he slipped. One of the strange lions jumped at him and knocked him down; the other strange lions at once rushed upon him and began to bite him. It seemed as if he must be killed.

Then a strange thing happened. The biggest lion of all the lot flew at those which were biting the man, and began to attack them with all its strength. That was the trainer's own favorite lion, and it was now fighting to save his life. So bravely did it fight that, although it was badly bitten, it kept the others off until men could open the door and drag its master out. He was very much hurt, and was in a hospital for nine months before he could walk. The bite of the first lion had broken his leg; but in the end he got better, and often performed with the lion which had saved him.

THE STORY OF AN OLD LION AND A BRAVE LITTLE DOG

Many lions are born in zoological gardens. The Zoo at Dublin is famous for its young lions. Most of those born at the London Zoo die, but those born in Dublin are nearly always strong and healthy. One of the Dublin lionesses lived there so many years that her children numbered fifty. When she grew very old she was not able to move about as quickly as she had done. The result was that horrid rats used to get into her cage, and, finding that she was no longer nimble, they used to bite her feet. The poor old lioness was much troubled in this way, so that her life became a misery to her.

At last things became so bad that her keeper put a brave little dog into the cage. As soon as the dog went in, the old lioness got up to kill it, but the dog took no notice of her. He saw a great ugly rat in a corner of the cage, and he meant to have that out of the way even if the lioness killed him the next minute; so he flew at the rat and killed it. Then the old lioness sat down and thought. This little dog, she saw, had been sent not to annoy her, but to be a good friend. So she showed him that she meant to be friends with him. And each night after that, before she went to sleep, she used to call the little dog to her and fold her great paws round him; and so they used to go to sleep together, the dog's head resting on the broad chest of the lioness. No rat dared to go near her after that, and she passed the rest of her days in peace.

THE SWORD-TOOTHED TIGER THAT LIVED IN PAST AGES

The tiger is more to be feared, perhaps, than the lion. It does not live in Africa, but is to be found nearly all over Asia, and especially in India. It is cunning and cruel; it will kill animals when it does not need food. It has not the grand head and mane of the lion, but it uses its strength just as surely.

Once there were tigers in America, more terrible even than those living to-day, as shown on page 153. They had two teeth which the tiger of to-day has not got. These two teeth were great blades which grew down from the upper jaw. They were like sword-blades, and the name given to that tiger is the "sabre-toothed" tiger. It had legs bigger and stronger and claws more powerful than the tigers of to-day. With its great teeth and big mouth it could break the backs of huge beasts such as then lived.

MEMBERS OF THE GREAT CAT FAMILY

The wild leopard climbs trees, which lions and tigers do not. The leopard crouches on a bough and lies in wait to spring upon an animal passing below.

The lynx climbs trees and eats birds. It has wonderful eyes. When we speak of anyone who seems to see everything, we call him "lynx-eyed."

The snow-leopard lives where it is very cold. It has a coat of warm fur nearly white, so that it can steal unseen over the snow and pounce upon its prey.

The puma, which people in America call the "American lion," kills cattle and horses, but never attacks a man unless first attacked by him.

The cheetah is one of the few wild animals which can be made to serve man, and in India princes keep many cheetahs to hunt antelopes.

The jaguar is a more savage-looking beast than the leopard, having thicker legs and a heavier head. Like the leopard, it has a spotted coat.

LITTLE ANIMALS THAT WORK FOR NATURE

Our dogs were all wild, like these, once, and there are still wild wolf-like dogs in Ireland.

This is a ferret, the ferocious little animal used for "ferreting" out rats. It is a kind of polecat.

This is a weasel, found in nearly all American woods where birds and rabbits are. It robs birds' nests.

This is a pine marten, which twists and turns its long, thin body like an eel. It can kill lambs.

This is a polecat, which does great harm by killing poultry and eating eggs. It has a horrid smell.

This is a badger, a shy, handsome animal with long fine hair. It has very terrible jaws.

This is a civet, a small animal with sharp teeth, and a valuable scent collected by men for making perfumes.

This is a mongoose, the little long-bodied animal tamed by men because it kills snakes, rats, and mice.

The picture of the pack of wolves is by Robt. Morley, R.B.A.; the other illustrations are by Gambier Bolton, H. Dixon & Sons, Lewis Medland, C. Reid, Dando, G. Rankin and Douglas English.

THE HYENA & THE BROWN & POLAR BEARS

The hyena is a fierce creature, which hunts in packs at night and steals all it can get. It is a cowardly animal, with great power in its teeth.

This is a big brown bear, which climbs trees and might kill a horse or a man. These bears usually live in caves and sleep throughout the winter.

The Polar bear lives near the North Pole where it is all ice and snow. He lives chiefly upon seals and walruses, but if he can he will kill and eat a man. In winter the female bear buries herself in the snow and does not wake up until the spring, when she generally takes her husband a little baby bear.

How the tiger hunts his prey

Animals are often colored like the scenes in which they live. The lion loves the open ground, so its fur has become a mixture between yellow and gray, like the sand and rocks. The tiger hunts in marshes or among long reeds and grass, so its coat is a fawn color with stripes of black, or a color almost black. When it crouches down among the reeds, or tall grass, it looks like the ground, with shadows of the reeds showing on it.

Although lions and tigers kill men and men's cattle, they do not do this all their lives. Lions like antelopes, zebras and giraffes. The tiger eats deer and wild pigs and pea-fowl. When the tigers get old, or after they have been injured, it is less easy for them to catch wild prey, so they creep nearer to the homes of men, and take their cattle. The tiger does this very often in India. The poor natives who are set to guard the cattle are terribly frightened when they see a tiger, which, twice in a week, will carry off a cow. The man runs away, and so shows the lion or tiger that he is afraid. When it sees this, the animal will not trouble to attack the cattle, but will spring upon the man and take him.

The tiger in India that tried to catch Lord Curzon

Hundreds of people and thousands of cattle are killed by tigers every year in India. The natives are not only afraid of the tigers because of what they do; they are afraid of them because they believe that men, after eating a certain root, die, and are turned into tigers. When they have once tasted human blood, lions and tigers become very bold, and will visit men's dwellings at night and carry off anybody who is not in his house. One tiger in India killed 127 people, and caused such fear that for six weeks nobody dared to go near the village against its home. Once, when Lord Curzon was resting at a monastery in Korea, where he was traveling, he heard sounds about the passages, and in the morning he found that a great tiger had been prowling around, trying to catch him for its supper.

There is not a more beautiful animal in the Zoological Gardens than the leopard; neither is there an animal more cruel. There is a leopard in London which the King brought home from India. It bit a man's arm off when he went on board a ship. Another leopard at the London Zoo plays with its keeper when there is nobody else about. It was born in India and tamed by a lady when quite a tiny thing. It was very fond of her, and used to romp with her like a big kitten. But as it grew up it got so strong that it used to tear her dresses to pieces with its great claws when playing with her, and there was always the fear that some day it might hurt her, taste blood, and kill her. So she sent it to the Zoo, where it is now.

Leopards hide in trees and spring upon their victims

Leopards are more like tigers than lions, for they have no manes, but they are spotted, instead of striped, as the tiger is. When wild, they are even more to be dreaded than the lion or the tiger —for they climb trees, which lions and tigers do not. They crouch down on a bough, and as a child or an animal passes underneath they spring down and kill it. A cat loves to play with a mouse before killing it, but the cruel leopard seems to love to kill simply for the sake of killing. One night two full-grown leopards and three young ones got into a sheepfold in South Africa and killed nearly a hundred sheep. It is a most cunning animal. Though it will not attack a man who has a gun, it will spring on a poor native who is unarmed. But women and children have most to fear from it. A single leopard in India killed a hundred women and children as they came to draw water at a well.

Some leopards can live where it is very cold. These are called snow-leopards. They live high up in the mountains, where snow nearly always lies, and then their fur is long, to keep them warm, and nearly white, so that they may steal unseen over the snow upon their prey. When captured and brought into a warmer climate, where there is no longer any snow about, the coat of the snow-leopard often becomes darker.

The jaguar is a more terrible-looking beast than the leopard. It has much thicker legs, its head is heavier, and the spots upon its coat, instead of being round rings, like those of the leopard, are shaped like rosettes. Like the leopard, it climbs trees, and pounces down upon its victim. Its home is in America, where it attacks nearly every animal.

THE PUMA, THE ENEMY OF THE DOG AND THE KIND MAN'S FRIEND

Another of the big cats like the leopard is the puma, which men in the West call the mountain lion. The puma can kill a horse or an ox, but of all things it best loves the flesh of the dog. It can be tamed, but you must not let it see a dog, for that will tempt it too much. A tame one at a menagerie was taken out of his cage to the front of the show. All went well until it saw a dog in the crowd. Master Puma forgot that he was tame. He bounced off the show into the middle of the crowd, sending the people screaming in all directions. He killed the dog, then, seeing another, he raced on and killed that. Then he went back to the menagerie, carrying one of the dogs in his mouth.

There is this to be said of the puma; although he will fight the jaguar and the bear, and will kill cattle and horses, he rarely attacks a man unless he is himself first attacked. People sleep without any protection when they know that pumas are about, for they call him the kind man's friend.

HOW THE CHEETAH IS MADE TO HUNT THE ANTELOPE

One of the few savage animals which, after being caught, can be made to serve man is the cheetah. If he is caught wild, he can be taught to hunt for his master; but he cannot be made to do this if he has been born in captivity. Princes in India keep many cheetahs, just as many men in England keep packs of hounds for hunting foxes. When it has been trained, the cheetah is taken near to where there are deer or antelopes. At first its head is covered with a hood; when this is taken off the animal creeps away to where it sees the deer, and, springing upon one, catches it for its master. It is like the leopard, having a spotted coat, but it cannot climb trees.

When we speak of anybody as "lynx-eyed," we mean someone who has very good sight, who seldom fails to see anything which is to be seen. That name is taken from the lynx, a wildcat with tufted ears, which climbs trees and eats birds, but in Canada lives mainly on hares and mice. The polecat is another fierce animal with an unpleasant scent. It can be trained to catch rabbits if caught young; but when wild it does much harm by killing poultry and eating eggs. It belongs to the same family as the stoat and weasel, which rob nests and kill rabbits. These are to be seen in nearly all English woods where birds and rabbits are to be found. The ferret, which men use to "ferret" out rats, is a sort of tame polecat.

The weasel family is a big one. It includes the otter, which swims and dives splendidly and catches fish; the glutton which lives in the cold countries and is a terrible foe to the beaver; the stoat, with its brown coat in summer and white coat in winter, and its everlasting appetite; and the weasel itself, which eats rats and mice and birds. If a stoat or a weasel gets into a poultry run, no chickens will be left alive.

THE LITTLE SHARP-TOOTHED MEMBERS OF THE WEASEL FAMILY

The pine marten is another of these little animals with long, thin bodies. They are terrible little creatures, though they are so handsome. Some years ago a farmer in Ireland had fourteen out of twenty-one lambs killed, and the next night the other seven were served in the same way. When a search was made it was found that the whole of the damage had been done by two pine martens. Another marten very like this lives mostly in northern forests, and is one of the most valuable of the Canadian fur-bearing animals.

The most famous of the weasel family is the sable. This little animal has a brown coat in summer, which becomes thicker and darker and glossier in the cold weather. Its fur is so precious that men go into the cold, frozen wastes of Siberia to catch it, and in seeking it they have explored and made maps of lands where civilized men had never been before.

Another animal with a scent is the civet which lives in Africa. The scent of this one is not unpleasant, but is valued, and the civet is kept tame, so that men can always get a supply of the scent. This is passed from the animal's body, like wax or honey, into a little pouch, from which it is removed by men who sell it to be used for making perfumes.

A little long-bodied animal which is much prized is the mongoose. Men tame it and have it about their houses, because it kills snakes and rats and mice. So long as it is kept under control, all goes well; but if it is not controlled, then woe

betide its master. Many years ago the island of Jamaica swarmed with rats. These creatures ate the sugar-canes and ruined the planters. A number of mongooses were taken there from India, and turned loose in the fields. They quickly killed and ate the rats, and then people would have been glad to get rid of them. For they killed all the useful little animals in the island and became as big a plague as the rats.

THE BEAR THAT LIVES IN A WORLD OF ICE AND SNOW

In the frozen Arctic regions the animal which men most dread is the Polar bear. It is not so fearful a bear as the one which used to live in Europe and Asia. That was called the cave bear, and was so big that two of them would have weighed more than three of the biggest bears now in the world. The Polar bear lives chiefly upon seals and walruses, and on the flesh of whales, but he will kill and eat a man.

In winter the female bear goes some distance away from the sea and lies down and buries herself in the snow. Then she goes to sleep for the whole winter, while her husband is out getting food and keeping himself warm as best he can. When she goes out in the spring from her snowy home, the she-bear generally takes a baby bear with her to show to her husband. The Polar bear can swim, and can make his way over smooth ice where no horse or man could go, the reason being that his great feet are covered with little hairs, which prevent him from slipping.

The Polar bear would, perhaps, not know what to do if he came to a tree; but the black bear, or any other bear which does not live in the Polar regions, would know what to do. They would climb the tree if there were a bees' nest or a man at the top. Wherever there is food they will go. They will eat roots or berries; they will eat honey; they will catch and kill a horse or a man; they will eat the body of a man or an animal which has died. Nearly all the bears go to sleep in the winter. They get so fat in the summer that, while they are sleeping in the winter, they can live on the strength which is stored up in their fat. They are thin and hungry when they come out of their hiding-places in the spring. That hiding-place is generally a cave or some other hole; it may even be the inside of a great hollow tree.

THE WOLVES THAT CHASE THE HORSES IN THE GREAT RUSSIAN WILDERNESS

The wolf is not so big an animal as the bear, but he is more to be feared. There are so many wolves, and they travel so fast and so far. They hunt together in large packs, and in the winter, when snow is on the ground and food is hard to find, they run for miles and miles to chase horses and men.

In Siberia and Russia, and other cold countries, wolves hunt men who are driving in sledges. No matter how quickly the frightened horses gallop, the wolf can keep up with them. Sometimes the driver is compelled to cut the harness of one of the horses and let it go, so that the wolves may seize that, and enable him to get safely away with the other horses while they are devouring it. But if there are many wolves, some will still follow the man, and in the end run him down. If, while he is being chased, the man shoots a wolf, some will always stop and eat the one which drops, but the others go on. When hunting animals they are just as determined. Two will hunt a deer as the lion does, one lying in hiding while the other drives the deer towards it.

Wolves are found in many parts of the world, and in America there are two kinds, the gray or timber wolf, which has been described, and a smaller prairie wolf, or coyote, which is not dangerous, but is a great pest to Western farmers, killing their lambs and poultry.

THE CUNNING FOX AND THE WAY IN WHICH HE CHEATS HIS HUNTERS

A small cousin of the wolf is the fox, of which there are several kinds. The best known is the red fox, which Englishmen on horseback hunt with hounds as a form of sport. It is a handsome but cruel animal. Like the leopard, it will kill all it possibly can. In one night it will kill scores of fowls, though it needs but one or two.

The fox lives in a hole burrowed in the ground, or in the root of an old tree. Sometimes it will share a burrow with a badger. The badger is a shy, handsome animal, with long, fine hair. No other animal of its size has such terrible jaws. The badger and the fox do not

fight, or it would be bad for the fox. Sometimes they live together in a burrow which has two little rooms at the end. In one the mother fox rears her babies, and in the other the badger nurses hers. Although the fox does not bite so hard as the badger, its bite is dangerous, and men have gone mad from a wound caused in this way.

The fox is as bold as it is cunning, and, like the skunk, the fox has a strong smell, and wherever it goes it leaves traces of this smell. It is this which the dogs are able to follow. They can chase a fox which they cannot see. They do not look for the animal; they simply keep their noses to the ground, and follow wherever the scent leads them. The same sort of red fox lives in the United States, but here it is not hunted on horseback, but with traps for the sake of its pretty fur. In the Southern States lives a smaller kind, the gray fox, which often climbs trees.

THE WILD DOGS, THE WOLVES, THE JACKAL, AND THE HYENA

Our dogs were all wild once upon a time. The dogs and the wolves and the foxes and the wild dogs still living in places abroad all come from the same father and mother, far back in the ages. There are still to be seen in Achill Island, off the West Coast of Ireland, dogs which are simply little wolves and nothing else. We need not be surprised, then, that the ways of wild dogs and wolves are alike. Wild dogs hunt just as the wolves do. They will attack any animal when they are hungry. The wild dogs in oriental towns keep the streets clean. They come into the towns at night and eat up all the refuse which they find lying about in the streets, and so help to keep these places healthy.

The jackal does a similar thing in India. The jackal is really a smaller kind of wolf. He is a wretched creature, and runs like a shadow after the lion and the tiger. When the tiger has killed an animal and eaten as much as it wants, the jackals, which have been humbly creeping round about, rush out from their hiding-place, and devour the rest of the carcase. They eat up the filth of the villages; but they are great thieves, and dogs have to be kept to prevent them from doing still greater damage. They have a nose which is less pointed than that of the fox, but sharper than that of the ordinary wolf; and they have a tail like the fox.

If there is a more unpleasant animal than the jackal, it is the hyena. But, ugly and horrid as they are, they are important to the health of the countries where they live. If wounded animals get away and die in the forest, or if animals be left only partly eaten, their flesh, if allowed to lie in the sun, would very soon become poisonous, and cause disease to spread among the people who live near that part of the country. But where hyenas are about, this thing never happens. They set out in packs at night, and clear up whatever flesh they can find, not even leaving the bones.

HOW THE HYENAS HUNT IN PACKS BY NIGHT

The power of their teeth is wonderful. The thigh-bone of a great ox is cracked by the hyenas as easily as if it were a nut. When there is nothing else to be found in the wilds the hyenas make for the villages, and eat up all the rubbish that can be found there. If they did no more than this they would be very valuable animals; but they also steal everything they can eat.

They are such cowards that they will never dare to attack an animal which is standing still; but if they can get it to start running away they will fight. They creep up very quietly and stealthily to an ox or a horse, and jump up suddenly in front of its nose so as to frighten it. This will in all probability start the creature running frantically away. That is just what the hyenas want. They rush after it, howling and biting at its legs, so as to get it away from its companions. When the poor animal is weary from running and from loss of blood which the many bites have caused, it sinks to the ground. The hyenas then rush on to it and tear it to pieces, and when the morning comes there is left not a single unbroken bone.

There are too many hunting animals in the world for us to note each one by name, but we have considered the majority of the most important in the groups to which they belong. All those whose habits we have now studied are called carnivorous, which means that they eat flesh.

THE NEXT NATURE STORIES ARE ON PAGE 215.

WHY CAN'T WE SEE IN THE DARK?

CONTINUED FROM 99

"THE dark" is the absence of light. Now, what is the name for the absence of sound? What do we call the state of things when we hear no sound? You know very well that the answer is silence. Let us remember after this always to think of darkness and silence as if they were a pair of things. Darkness is the absence of light, and silence is the absence of sound.

But there is more to say. There may be a wave motion in the ether, but it is hardly proper to call that light until someone sees it. There may be a wave movement in the air, but it is hardly proper to call that sound unless someone hears it.

Seeing and hearing, then, depend first of all, on there being something outside of us—a particular kind of wave; and, secondly, on our being able to feel that something. In order to see, it must be there.

That is why we cannot see in the dark—because there is no light, and it is only light that we see. But, also, the seeing eye is necessary. A table in a dark room is there, though we cannot see it There is no light, and so we see nothing. When we *do* "see the table," as we say, we really see the light coming from it, and the form of the light tells us the table is there. A blind man cannot see, even in the light. The great English poet, Milton, in his poem on Samson, makes Samson say, when he had lost his sight:

"Oh dark, dark, dark, amid the blaze of noon!"

That famous line will help us to understand what darkness may depend on—either the absence of light, or the absence of the power to see light.

WHY CAN TIGERS AND CATS SEE IN IN THE DARK?

We must know that nobody at all can see if it is perfectly dark—that is to say, if there is no light at all coming from anywhere; but when we usually speak of being in the dark, we mean that there is so little light that we see hardly anything.

That is because our eyes are so made that they cannot alter themselves to suit the conditions of very dim light; but some animals can make the pupil of the eye so wide as to get the benefit of whatever rays of light are about. This is the case with cats, and if you watch the cat's eye when it is in the dark you will see that the pupil appears much enlarged. This allows all the light possible to enter the eye, and the cat, and other animals that have eyes like it, are able to see very much better in dim light than you or I can.

WHAT IS QUICKSILVER?

Quicksilver is a very good and expressive name for one of the elements. Now, silver is an element, and quicksilver is not silver, but it has a silvery appearance. When we say quick nowadays we think simply of something moving, but the real meaning of quick is alive, and quicksilver really means live silver. It is so called because it seems to move almost of itself. One of the Roman names for it was "living silver," which is exactly the same as our popular name for it. The strict chemical name for it means water-silver, but the name by which it is generally known is *mercury*, which was the name the Greeks gave to the messenger of the gods. We have said that quicksilver, or mercury, is an element, and we know now what that means. It is not a kind of silver, nor a mixture of water and silver, nor anything else but itself. It belongs to the group of the metals, like gold and silver, lead, iron, and so on, but it is unlike all other metals in being liquid at ordinary temperatures. Of course, other metals, gold and iron and what not, can be made liquid, but that is only when they are intensely hot. That is all we need say about mercury now, except that it is very heavy, so that even iron and lead, heavy though they be, can float upon it.

WHY DOES QUICKSILVER RUN AWAY WHEN WE TOUCH IT?

These questions have been asked and wondered about ever since mercury, or quicksilver, was discovered, more than 2,000 years ago. There is no other element, and no compound, which behaves in the same curious way as mercury — which almost seems alive. The reason is that here we have something which is liquid, and has the properties of a liquid, yet is exceedingly heavy, while the tiny particles of it have a very great attraction for each other. The reason we cannot pick up quicksilver is that it is a liquid. We should not expect to be able to pick it up any more than to pick up water, only it looks so different from any other liquid we know that we can scarcely believe it is a liquid, and so we expect to be able to pick it up. Being a liquid, it runs, as water runs, and that is what happens when it is touched. We can only begin to understand the curious way in which mercury behaves if we first remember that it is a liquid, and that it must do what other liquids do.

WHY DOES QUICKSILVER ROLL UP INTO LITTLE BALLS?

The special peculiarity of mercury as compared with any other liquid is that the atoms of which it is made have a very powerful attraction for each other. We see this same attraction when water forms in drops, but while water will form in drops on some surfaces, it will not on others. If we put a drop of water on a piece of blotting-paper, the attraction of the surface of the paper for the atoms of water is greater than their attraction for each other, and so the drop of water is broken up, and the water wets the paper. But though a drop of mercury is a true liquid, just like a drop of water, it will not wet the paper. Even if it is split up it simply splits up into smaller balls or drops. This is because the atoms of the mercury have a very much greater attraction for each other than they have for the surface of the paper, so they keep to themselves, and, as they are all pulling towards each other, they naturally make round balls.

WHY DO WE NOT SEE OUR BREATH ON A WARM DAY?

We know that our breath is warmer than the air outside; but though the breath coming out of our bodies is always of very much the same temperature, the air outside varies very much. Sometimes the air outside is so warm that it does nothing in particular to that gaseous water — or water in the form of a gas — which is always in our breath; and so we see nothing. But on a cold day this gaseous water, as it leaves our bodies, is suddenly turned so cold that it forms a little cloud, made, like other clouds, of drops of water. That is what we see when we say that we see our breath. It is the water in our breath that has been turned liquid by the cold. There is just as much water in our breath on a warm day, but then it remains in the form of a gas as it comes from our bodies. But if we take a piece of cold glass, even on a warm day, and breathe on it, we get a little cloud of water forming on the glass, and that is "seeing your breath."

WHY DOES A DUCK NEVER GET WET?

There are really several reasons. For one thing, the plumage or the feathers which cover the body of the duck are very thick and very smooth. The feathers are so thick that the water on which the duck is floating does not come in contact with the air underneath the feathers, so that the skin of the duck is kept quite dry and quite warm.

But this would not be enough by itself. There is a structure called a gland, which has an opening on the back of the duck near the tail. The business of this gland is to make oil, or grease, and quite a lot of oil is produced from it. This oil is used by the duck to smear over its feathers to make them extremely smooth and slippery, just as oil is used to lubricate a bicycle. Now, it is a very curious thing that oil and water will not mix, and so the duck—like any other bird which lives in the water—having covered its feathers with a thin layer of this oil, prevents the water from wetting the feathers, and so keeps its skin and feathers dry. Thus, as a matter of fact, the water does not affect the duck at all, and this gives rise to a common saying. If anything happens to a person, and that person takes no notice of it, it is said he is like a duck, because he is no more affected than the duck is by the water on its back.

WHY DOES A GLOW-WORM GLOW?

A glow-worm is not a worm at all, but is the female of a kind of beetle seen during the summer months up to the close of August, on warm banks and hedgerows and in woods and pastures. As soon as the evening's dusk begins, this beautiful insect begins to show a most exquisite yellowish-green light, caused by what are called luminous organs placed over the tail end. The object of this light is not very certain, but most of the wise men who study living creatures suppose that the female shows the light for the purpose of attracting the males, which do not shine in this way. Whether this is the real reason or not we cannot be quite sure, but the glow-worm is only one of many animals which show light by means of what is called phosphorescence.

WHY DO WORMS OR FROGS SWARM ON A COUNTRY ROAD AFTER A STORM?

Frogs are what are called amphibious animals—that is to say, they live part of their lives on the water, and part of their lives on the land—but they are never very active unless there is a good deal of moisture to be had. In fact, when the ground gets dried up, and it gets very hot, the frogs disappear down crevices into the dampest and coolest corners they can find, and as long as the nice dry weather lasts we do not come across many frogs in our country walks; but if there is a spell of wet weather, such as the frog delights in, he may be seen jumping about over the wet grass, and the wetter it is the better he likes it. His activity, like that of many other animals, is directed chiefly to the search for food, and it so happens that the particular kind of food the frog likes is also more abundant in wet weather. As a matter of fact, although the young frog or tadpole lives on vegetables, the adult frog lives on insects and worms and such small animals, which, however, must be moving about if they are to excite his interest. As this happens generally after a storm, we see the frogs especially at that time.

WHERE ARE A FROG'S EARS?

One might well ask where the ears are, when we cannot see them. But we must remember that an ear is simply something by means of which the animal can hear, and not necessarily anything that we can see. As a matter of fact, what we call ears are merely outside flaps of skin which, when they are large, serve the purpose of collecting the sounds in the air around. The real hearing is all done inside the skull, and in the case of the frogs, as in the case of birds and lizards, there is a little hole some distance behind each eye, and not far from the angle of the mouth. The frog is entirely without any outside ear at all. Inside this hole is the internal ear, and in the frog there is a middle ear, too, for the purpose of conducting the sound to a special nerve, which takes it to the brain where the real hearing is done.

HOW DOES A PEACOCK KNOW WHEN IT IS GOING TO RAIN?

It is not very easy to say what any animal does know and what it does not know. But if it is true that the peacock

can tell when there is going to be wet weather, we can only say that knowledge of that kind possessed by an animal is due to what we have learned to call instinct. Of course, you know that all birds, except those which live partly in the water, have a great dislike to getting their feathers wet; and in the case of the peacock, which has such a gorgeous array of plumage, it is quite obvious that a severe wetting would be most disagreeable. A peacock wet through would be a pitiable sight. Now, the more important it is for an animal to be spared disagreeable experiences, the more we find that the instinct to avoid them is present in the animal; and so in a bird like the peacock, which has a great display of fine feathers, the instinct to foretell wet weather has been highly developed.

WHY ARE SOME PEOPLE COLOR-BLIND?

We must understand that color is caused by waves of light of different lengths, which can be taken up by certain structures in the eye, just as sound is caused by other waves taken up by the structures of the ear. Now, in that part of the eye which we call the retina, certain parts can be affected only by *slow* waves of light, which cause a *red* color; other parts only by medium waves of light, which cause a *green* or *yellow* color; while still other parts are affected by the *fastest* waves of all, which give us the idea of *blue* and *violet*. In people who are what we call color-blind, there is some defect in these structures in the retina, so that certain definite waves are not appreciated by the eye, but only other waves. This means that some colors only may be seen, and such a person, therefore, is very apt to call a green thing red, and so on, because he can only see red waves, not the green ones.

WHY HAVE WE FINGER-NAILS?

We must always remember, when we ask what is the use of some part of our bodies, that all the higher animals are made on the same plan, and what is not of much use to one animal may be extremely useful to another. Now, you may think that our finger and toe nails are not of much use to us, but it is easy to see that they are very useful to those animals which have to scratch in earth or in sand, or have to defend themselves with their claws, which are their nails.

But finger-nails have a great use even for us, because by means of them our finger-tips are made very much firmer, and in that way we can grasp objects better. They also enable us to pick up small objects much more easily than we could without them. Finger-nails are really parts of the horny part of the skin, modified in a special way.

WHAT IS THE USE OF OUR HAIR?

Here again, as with finger-nails, is a part of our bodies which does not seem of any very great use to us, but which is very important to animals. Hair is Nature's way of protecting the body from cold and wet, and so we find that dwellers in very cold climes have a good deal of hair, especially in the case of savages. If we look at pictures of very ancient times, we see that the people are represented as being very hairy; and indeed, it must have been very important to them to be protected in this way, in the days before clothes were made. Nowadays, in what we call civilized countries, we wear such a lot of different kinds of clothes that it does not matter whether we are hairy or not. If you remember that hair, wool, fur, and bristles are all the same structure, you will realize that to most animals their hair is very useful.

WHAT IS IT THAT MAKES US HUNGRY?

We have had many questions about animals which we have answered by saying that animals know things, by *instinct*, and now we come to one or two questions about human beings which *we* know very much in the same way. No one needs to tell us when we are hungry. We know quite well without being told. It is one of the few instincts that human beings have. Even a baby knows when it is hungry. It is a fortunate thing that the cells of which our bodies are made have this power of making their wants known to us. As soon as there is too little food in the body, it means that the blood has not enough nourishment in it. There is a sinking feeling in the pit of the stomach, and it is this feeling which we call hunger. This is one of the few things that a human being knows without having to learn it.

WHY ARE SOME PEOPLE DARK AND SOME FAIR?

If we examine with a microscope the structure of the skin in animals or human beings, we find that it is made up of numbers of cells arranged in layers. Among these cells are found coloring matter, or pigment, as the artists call it; and it is the quantity of this coloring matter present in any individual which causes the complexion to be called fair or dark. In very fair people there is very little pigment. In very dark people, with brown eyes and black hair, there is a great deal of pigment; while others with not very much pigment are neither very fair nor very dark. This pigment goes on being produced for many years; but when it ceases, the hair becomes grey, because it is no longer colored. We see this usually in dark people.

WHAT MAKES PEOPLE WALK IN THEIR SLEEP?

There are two parts of our mind which control all our movements and actions. One part has to do with all those things which *we know we are doing;* while the other part does things *without our knowing* anything about it.

If we come to think of it, we do quite a number of things without being very conscious of them. For instance, we do not think about breathing, although we are always doing it. We do not think about our heart beating, although it never stops as long as we live, and there are some things which we can learn to do so well as to be able to do them without thinking at all. Walking is one of these things. When we were little babies we could not walk. Gradually, however, we learned to walk, and in time we got so accustomed to walk as to be able to move about quite well without any great effort of mind. Now, acts of this kind are sometimes done by people in their sleep, and they can do them just as well asleep as awake, because the mind has got so used to looking after such acts that it does not require the person to be conscious when doing these things.

So some people are found to walk in their sleep. This is really because one part of the mind is wide awake when the other is asleep. The curious thing about walking in sleep is that, just because the walker is asleep and not conscious, he can walk over dangerous spots which would probably cause him to fall, through nervousness, if he were wide awake. But as he is not awake, and not conscious, he generally walks safely, and remembers nothing about it.

WHY DO NOT SOLDIERS WEAR ARMOR NOW WHEN THEY GO TO WAR?

Soldiers do not wear armor in these days because they can fight better without it. Even if they wore it, the armor would hardly protect them as it protected men long ago, because bullets now can pierce armor as easily as a stone pierces a window. Men wore armor long ago because guns had not then been made. Then men fought with swords and spears and arrows and battle-axes. Against these, good armor would protect a man. It was almost impossible to kill an armored knight in battle. He wore a steel helmet and a steel coat; his legs and feet were encased in steel. The front part of his helmet could be raised, but on going into battle he lowered this, and was completely protected. If by any chance he did not lower this vizor, as it was called, there was a danger of his having an arrow or a spear thrust into his eye.

The common soldiers did not have complete armor like the knight's armor, so they were killed. What the knight feared was that he would be stunned by a blow on the head from a battle-axe, and be taken prisoner. If that happened, he might be killed after he had fallen, and so he used to wear a rich, flowing robe over his armor, to show that he was a man of wealth who could pay ransom if his life were spared.

But when gunpowder came into use, the armored knight and the unprotected soldier were placed upon the same footing—a bullet would kill either of them. So the use of armor was abandoned. The battle chargers of which we read were great cart-horses; when armor was abandoned, swifter, lighter horses were used, so that cavalry could move more quickly, while foot-soldiers could march farther and faster.

WHAT GIVES US EARACHE?

Headache and earache and toothache are caused by a great number of different things, most of which act upon some special nerves, or upon some part of the brain, causing a change in these structures which gives rise to a feeling of more or less intense pain. Sometimes the

nerve swells up, and if it is in a tight place, like the nerve of a tooth, there is no room for it to swell very much, and the result is that the pain is very severe.

WHY IS A ROAD HIGHER IN THE MIDDLE THAN AT THE SIDES?

If a road were not made higher in the middle than at the sides the rain would not drain away into the gutters, but would lie in puddles all over the road, splashing everything and everybody that passed. But the road is not so high in the middle as you may think. Suppose the road is 72 feet wide, the centre of it will be only six inches higher than the sides. That is the way in which the perfect road is constructed. If a road has too great a slope, it is bad for traffic, it causes all the horses and wagons to be kept in the centre, and so ruts are worn and the road destroyed by the unequal wear and tear which one line of route has to bear.

The Romans made magnificent highways. Some of them are still good after 2,000 years of traffic. But after the Romans left Britain their fine roads were neglected. They were never repaired; they became overgrown with weeds. The parts of the country which they had not paved had no proper roads, but only horse-tracks, which were so boggy and bad that they could not be used in winter. In the thirteenth century a law had to be passed compelling the people to cut down all trees and shrubs for a distance of 200 feet from all roads running between market towns, so that robbers should not hide and waylay travelers.

WHO MADE GREAT ROADS?

The man who made splendid roads was John Loudon McAdam, who was born at Ayr, in September, 1756, and died in Dumfriesshire, in November, 1836. He spent his youth in America, where he became rich; but on returning to Scotland he gave much of his time to experiments with roads.

After many trials he found that the best roads were to be made of thin layers of broken hard stones, all, as far as possible, of the same size, and none weighing more than six ounces. He was appointed to provide food for the warships at Falmouth, but while there he continued his experiments in road-making at his own cost, and he was appointed to look after the roads about Bristol. His roads were now talked about, and though he had many enemies who did not believe in his work, Parliament examined his plans, and decided that they were good. McAdam's generous work for other people made him quite poor. He traveled over 30,000 miles of roads in Great Britain in pursuit of his investigations, and had spent out of his own pocket over $25,000. Parliament presented him with $50,000 and thanked him for his work.

It was due to him that the splendid roads about the British Isles and all over Europe were made. Until the railways were built, his roads were the only paths by which commerce could travel on land. And now, when we hear of a macadamized road, let us remember the man after whom it is named.

WHERE DO BATS GO IN THE DAYTIME?

Bats are nocturnal creatures. That is to say, they sleep during the day and are active at night. So are many other animals. Nearly all the wild deer are, and the lions and tigers and leopards. These larger creatures can see by day, but the bats cannot. They are as blind in the sunlight as a dormouse. Therefore, as they would be helpless if a cat or a big bird were to see them by day, they hide away in dark places. In all the church towers, in corners and underground passages, in little openings under the roofs of houses—there the bats hang by day.

There is an enormous cave in Kentucky in which millions of bats are to be found, sheltering while the sun is shining. They cling to the rock and to each other in such thick clusters that forty bats were once counted in a space of a few inches. The Egyptian Pyramids swarm with bats. Inside all is dark as the darkest night, even on the brightest day, and travelers are astonished to find bats dashing about their heads. Dazzled and frightened by the candles, they fly about in great alarm and beat against the face, as a moth beats against the globe of the lighted gas. Some plants are like the bats—they sleep by day and open and blossom by night. Even the beautiful lily gives off its richest scent when midnight is at hand.

IS IT CRUEL TO USE A CHECK-REIN?

If, when setting out for a long walk, you had a piece of steel fixed in your

mouth and straps attached to it so that your head was fastened, preventing you from moving it, you would understand at once why it is cruel to use the check-rein. A check-rein is not the pair of reins with which we drive; it has nothing to do with driving. It is a short rein tightly hooked on to that part of the harness called the saddle, and its sole purpose is to make the horse arch its neck and "look proud."

Fancy thinking that a horse looks proud when you can see it is in such misery that it cannot be still when standing, or run freely when moving!

Some horses have naturally arched necks; others have not. It is the nature of a horse, when drawing a load, to stretch out its neck. This gives it more power to pull the weight behind it. By using

A CRUEL MAN'S HORSE

This horse has a check-rein. When you see a horse like this it is in pain, and is being cruelly treated.

the cruel check-rein men deprive the poor animal of free motion, and make its work doubly hard. All the time it is tugging and straining to get its head free, but the cruel rein pulls the bit, hurts the horse's mouth, and keeps its neck arched and confined, and, after its owner has enjoyed a beautiful drive, the tortured animal returns to its stable foaming from its exertions under cruel conditions.

WHY DO PEOPLE USE THE CHECK REIN?

Poor people who have to groom and feed their horses, and so understand them, do not use the check-rein. Thoughtless people and snobs use it. Sometimes people let their coachmen decide for them, and if the coachman is ignorant and stupid, thinking only about "looks" and nothing about a horse's feelings, he may use the check-rein.

The snobs use the check-rein to make their horses appear prancing, arched-necked, spirited steeds of great value, whereas, perhaps, so far as money goes, they are worth next to nothing. There are proper ways and means of making all horses, good or bad, look well—by feeding and grooming. But torture is not one of the ways, and whenever you see a horse with a check-rein you may know at once that its owner is either thoughtless, or cruel, or a snob, or a brute. And a horse with a check-rein, when it tosses its head and paws the ground and foams at the mouth, is not showing spirit; it is showing that it is in agony.

HOW DOES IVY CLING TO THE WALL?

The ivy is a plant which has the climbing habit. It has not strong branches

A GENTLE MAN'S HORSE

This horse has no check-rein. A horse like this, whose reins are free, can move easily and naturally.

which can stand by themselves, and so, if it is to spread out its leaves to the air and to the sun, it must hold on to something. There are thousands of plants which do this instead of forming stout branches as trees do. Some of them climb by thorns; the thorns of the rose, for instance, are made for climbing. Some of them hold on in other ways, as the ivy does, for it has no thorns. The creepers that hold on the best have actual little suckers, which give them a splendid hold of even quite a smooth wall. Ivy holds on mainly by taking advantage of little irregularities in the surface. If a wall is well built, ivy prolongs its existence by protecting it from the weather; but if a wall is very badly built, ivy does it injury by creeping in between the bricks. So it is best to build a wall well, so that we can make it beautiful with ivy, and preserve it by the same means.

WHY DOES A MATCH GO OUT WHEN WE BLOW IT?

When a match or a fire burns, it makes a certain amount of heat. Now, it needs heat in order that it shall burn at all, and that is why we have to put a match to a fire. Once it has started burning it will keep itself hot enough to go on burning as long as there is stuff to burn and air to burn it with.

Now, we can blow a match out because we blow away the heat in the hot gases which are just going to burn, and the whole thing becomes so cold that it will burn no longer, any more than the match would before it was struck. Any fire, the heat of which is in the gases it makes, can be blown out in the same way if we have a big enough wind to do it. You must have seen the wind blow out a fire at a picnic. But the wind cannot blow out a coal fire, because much of the heat which keeps the fire going is in the glowing coal itself, and the wind cannot blow that away. We can make a match burn more quickly by blowing on it gently enough, so as not to blow its heat away altogether, but so as to keep up a brisker supply of air than if we were not blowing at all.

WHY DOES THE TEA RISE TO THE TOP OF A LUMP OF SUGAR DIPPED IN IT?

This question really has to do with the same subject as the last. Water, and watery things like tea, behave in just the opposite way to quicksilver. When they get a surface on which they can spread themselves, they do so, but quicksilver keeps to itself. You would not get quicksilver to run up into a lump of sugar. We must think of the sugar as if it were a lot of little tubes all put together, and then it is easy to show, by a simple experiment, what happens.

If we take a thin glass tube and dip it into water, the water will spread itself out on the inside surface of the tube, and will rise a little higher in the tube than outside, and where the water stops it will have a cup-shaped surface, because the water all round, where it is next the glass, creeps up the glass a little. It is just this that happens when tea runs up a lump of sugar.

But mercury acts in exactly the opposite way; it is not attracted by a surface, but pushed back, and the picture shows the difference between the behavior of water and that of mercury when a thin tube is pushed in to them. When mercury is pushed back by the tube, the surface of the mercury is shaped like a cup upside down, because all round the edge of it it holds itself back from the glass, just in the opposite way to the water, which creeps up the glass.

DO ANIMALS KNOW WHEN THEY ARE BEING TREATED KINDLY?

Not even the wisest man can tell you how much animals know and how much they do not know, and it is still more difficult to say how much they can appreciate; but what we do know is that all the animals that man makes use of, or with which he lives much, can feel pain very readily, and are capable of great suffering. Whether they know they are feeling it is a different matter, much too deep a question for us here. But the most important point about this subject is this—that whether animals appreciate kindness intelligently or not, it makes a very great difference to the human being who treats his animals well. No one who is cruel or unkind to animals will be kind to his fellow-creatures, and therefore we should always try to treat animals as kindly as one of ourselves, so that we may grow kind to all living things.

CAN A POISONOUS SNAKE BITE IF IT LIKES, WITHOUT POISONING?

Some can and some cannot. The way that poisonous snakes use their fangs to inject poison is one of the most wonderful things in Nature, and in the case of some of them—for instance, the common adder or viper, which lives all over Europe—this poison fang and its venom are only used as a means of self-defence, or for getting food.

But the adder as a rule does not use its poison fang when it bites the animals on which it feeds, and so it has a very curious arrangement, by means of which these fangs are laid flat back in the roof of the mouth out of the way of the ordinary teeth which are used for feeding. Thus the adder can use one or other sets of teeth just as it likes when it wishes to kill its foe, and it can tuck its fangs securely out of the way and use its ordinary teeth when it wishes to swallow a mouse. In some of the other poisonous snakes the fangs are fixed, and cannot be used in this way.

THE NEXT QUESTIONS ARE ON PAGE 317.

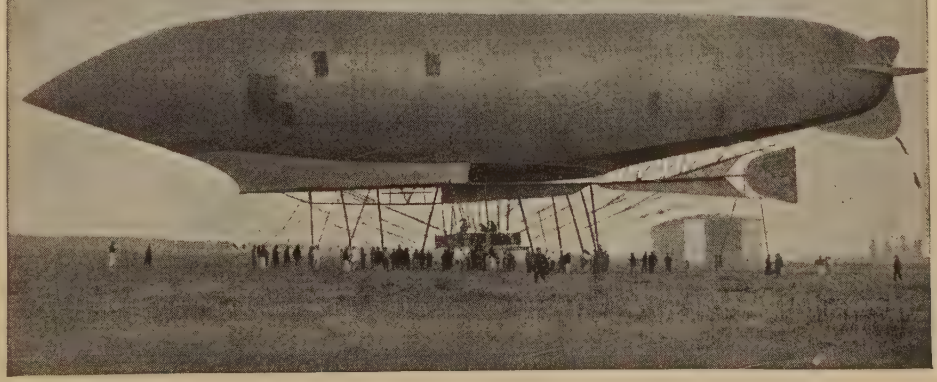
SAILING IN A SEA OF AIR

The time was long, long ago in the story of the world, when men traveled only on land, before they learned to make a highway of the sea. To-day men are seeking a third highway—a highway of the air.

The earth is enveloped in an ocean of air, and in this ocean men have long known how to sail in baskets hanging from silk balloons. But sailing in balloons is low, and men are seeking new ways of travel in the air. One thing is wonderful to notice—the huge machines that men must make to be able to do what a bird or a fly can do. That is the remarkable fact in the story of men's learning to fly. A balloon sails because it is filled with gas which makes it lighter than the air it rests on; but a bird flies although it is *heavier than air*, and it is the secret of how to fly with a machine heavier than air that men are now trying to solve.

The airship on this page is as large as a steamer, with machinery working two propellers, that drive it forward in the air, and a rudder to steer it on its way. But though it can be guided in calm weather, it is tossed about in a storm, so that it has all the drawbacks of a balloon, which is at the mercy of the winds.

The pictures on the following pages show us the ways in which men are learning to imitate the birds.



THE MAN WHO SAILED ACROSS THE ALPS

Here we see a steerable balloon invented by Count Zeppelin. If placed with one end on the ground in Madison Sq., N. Y., its other end would be nearly two-thirds the height of the Metropolitan Tower, and yet it could carry only some twenty people. A steamer of the same length could carry over 1,000 passengers. This shows how clumsy a balloon is. The vast cylinder which we see here, hovering over the town of Zürich, is filled up with about twenty balloons, each full of gas, and all to hold up two little cars. Zeppelins made many voyages across the North Sea during the European War, and did much damage in England.

In this great French steerable balloon the propeller is not at the back, but at the nose of the car, and instead of pushing the balloon forward, it has the effect of pulling it. This airship has, of course, the fault of all those of the same class, for it is impossible to control so great and light a body against strong winds. While these balloons are helping men to learn how to navigate the air, it is not likely to be by these that man will be able to do what a bird can do. The successful machine will be more like a bird.

The photographs on these pages are by the Illustrations Bureau, Rol & Co., and others.

THE RIDERS ON THE WIND

A WONDERFUL THING THAT HAPPENS BEFORE OUR EYES

CONTINUED FROM 83

FOR centuries men have been wanting to fly. Many attempts were made, with various kinds of mechanisms, only to fail. In 1782, and 1783, two brothers named Montgolfier made hot air balloons, which rose high in the air. Two men dared to go up in one of these in 1783, and soon many voyages were made. Soon, however, hydrogen gas was found to be better than hot air, and very large balloons were built. These were the first balloons, but for over a hundred years no way was found by which the flight of a balloon could be controlled. Whichever way the wind blew it the balloon must go.

HOW THE BALLOON WAS IMPROVED

In spite of all the disadvantages, interest in balloons has continued to the present. Men have gone higher and higher until now the record, made in 1901 by two German scientific men, is nearly seven miles in the air. Until 1919 the longest trip was nearly 1,500 miles. This was made in 1913, by a Frenchman, who started in Paris and landed in Russia. Men have learned much about air-currents and temperatures high in the air, through such trips as these. Balloons have also been of use in war, and are still used.

An important improvement in balloon flight was made by attaching a small engine with a propeller and a rudder to the basket of a balloon. If there was not too much of a gale, the balloon could be guided, and might even make some progress against a slight wind.

The next steps were taken by Santos-Dumont, a Brazilian gentleman residing in Paris, and by Count Zeppelin, a German. Santos-Dumont used a sausage-shaped balloon with a pointed end, and, in 1901, won a prize of $20,000 for circling the Eiffel Tower in Paris, and returning to the starting point in half an hour. The daring inventor later turned his attention to aeroplanes and neglected airships. Other Frenchmen, however, have continued to experiment, and others as well. A Bavarian officer, Major von Parseval, has made balloons which may be guided.

COUNT ZEPPELIN, WHO BUILT ENORMOUS AIRSHIPS

Count Zeppelin worked on another plan. He made the outside of his airship of thin metal, and divided the interior into several compartments which were filled with gas bags. If some of these burst, the others would keep the balloon up. Cars for en-

Copyright, 1918, 1919, by M. Perry Mills.

gines, crew and passengers were suspended from the metal shell. In 1900 a successful ascent was made. Other and better airships were made until, in 1910, a trip of three hundred miles was made in a little more than nine hours. This trip is famous because on it the airship carried passengers. Other airships constructed by Count Zeppelin made hundreds of trips, each carrying twenty-four passengers, besides the crew. A speed of over fifty miles an hour was reached sometimes, but the airships were very large and very heavy and several were destroyed by high winds.

During the Great War the Zeppelins, as these immense airships came to be called, were used for military purposes. They were able to cross the North Sea and drop bombs on various parts of England, or to fly over France and attack Paris. They were, however, forced to remain so high in the air in order to keep out of the way of the anti-aircraft guns, that they could not drop their bombs with much idea of where they were going to fall. Some of the bombs fell in open fields, and others in cities.

THE MACHINE WHICH IS HEAVIER THAN AIR

All of these machines are lighter than air, but the greatest success was finally to come to machines heavier than air. Many men have studied the question during the centuries. The great painter, Leonardo da Vinci, of whom you read in another place, had many ideas on the subject. Long ago others are said to have been able to glide from a height as a flying-squirrel does, but none of them really flew. During the later years of the nineteenth century many more men were working. A German, Otto Lilienthal, and Octave Chanute, an American citizen, worked on gliders, with which they could descend from great heights, and could guide their descent. Lilienthal made over two thousand flights before he was killed.

Sir Hiram Maxim, the distinguished English inventor, made a machine with an engine, which almost flew when the trial was made in 1894, but it was not quite right, and Sir Hiram did not continue his experiments. Professor S. P. Langley, of the Smithsonian Institution, in Washington, was working on the question at the same time, and finally persuaded Congress to give him $50,000 for experiments. He had made several small machines with engines which flew without a man, and finally built a large one to carry an engineer. When it was tried, the machinery for starting went wrong twice and the machine was broken. Professor Langley had used up all the money which had been granted him, and his failure caused so much ridicule and criticism, that he is said to have died of a broken heart. He was on the right track, however, and since his death it has been shown that his machine could have flown if a few changes had been made. It is fair to say that Professor Langley is the father of the flying machine.

All of these later men were learning much about the size and shape of the wings, but those who tried to use power found that the steam engine was too heavy for the amount of force it would develop. About this time the gasoline engine, such as we now see in motor cars, was much improved. Two young Americans decided to try to make it drive an aeroplane.

TWO YOUNG AMERICANS SOLVE THE PROBLEM

Orville and Wilbur Wright had a shop for the repair of bicycles, in Dayton, Ohio, and had had experience with motor-cycles. They began, in 1900, by experimenting with gliders in order to learn the best shape and size for the wings. In order that they might not be disturbed, they went to a lonely place on the seacoast of North Carolina. Finally, December 17, 1903, a machine rose carrying a man and stayed in the air for fifty-nine seconds. The problem was solved. After this there were many improvements, but they were improvements only. A man had flown in the air.

The Wright brothers kept on trying, and, in 1905, made a flight of twenty-four miles, and returned to the starting point. Longer and longer flights were made, and, in 1908, Wilbur Wright made at Le Mans, France, the longest flights ever made up to that time. In one he covered fifty-six miles, and in another remained in the air two hours and twenty minutes. These two Americans had been able to do better than all the trained scientists and the most skilful workmen of the world.

SOARING WITHOUT AN ENGINE, AS THE BIRDS DO

The greatest danger in aeroplanes is their liability to capsize in the air. The Wright brothers spent time studying ways to prevent this, and to make the machines more steady. During 1911 they went back to the lonely coast of North Carolina, and there on the sands tried to discover how the great birds you have seen suspended motionless in the air keep their balance. This is a photograph of Orville Wright in his glider, which remained in the air on this occasion five minutes. The picture was taken at Kill Devil Hill on the coast of North Carolina. On these sands there are no trees to influence the wind currents, nor to catch the machine.
Photograph by Brown Bros.

Never was an invention hailed with more excitement. All the world realized at once that the air had really been conquered. And yet it was so simple; a huge box kite with an engine-driven propeller as a substitute for the string. Within a few months men were building flying machines in all the civilized countries. Naturally those of mechanical training took the lead and almost at once across the English Channel from Calais to Dover, a distance of twenty-one miles. Then the enthusiasm of the English was awakened and Farman, an Englishman, distinguished himself for his daring flights. Glenn H. Curtiss, an American, was another of the pioneer aviators who astonished multitudes by their exhibitions of daring and skill in Europe and in America.

Many types of aeroplanes were put into use in the great European War. This particular German type is called a "Taube," that is, "a dove." This picture was taken from beneath while the aeroplane was in flight, and shows plainly the great crosses on the wings. They were placed there so that the aviator would not be fired upon by the guns of his own side. The Germans use several other styles, some of them very swift. Picture copyright, Brown and Dawson, Stamford, Conn. From Underwood and Underwood.

improvements were made which rendered flight safer and control by the aviator more certain. Aeroplanes with one pair of wings, called monoplanes, were built, and some had three. The Wright machines were called biplanes because they had two pairs of wings.

THE FIRST FLIGHTS FOR LONG DISTANCES

At first the French took the lead. Santos-Dumont abandoned balloons and built several aeroplanes, and, in 1909, a daring Frenchman, named Bleriot, flew

Mr. Curtiss also invented a hydroaeroplane, or hydroplane, as it is sometimes called, though other men had been working on the same idea. This is a powerful aeroplane which has light boats firmly attached. It is able to rise from water and to alight without danger. It is, in fact, a sort of flying boat.

During the first few years many of the aviators lost their lives, for they had to acquire skill by themselves and learn the tricks of the treacherous air currents. It required many accidents to teach them

that the higher they went the less was the danger; for in falling there was more time in which to regain control of the machine. The most serious cause of possible mishap was the sudden stoppage of the motor, which might happen through the breakage of any one of its many delicate parts. This would cause the aeroplane to slacken speed; then, suddenly, it would tilt backward and fall, just as you have seen a kite throw up its tail and swoop downward.

How the aviators keep from falling

To-day the experienced aviator knows what to do in such a case. By means of the lever in his hands he throws down the elevator, as the rudder that raises or lowers his machine is called, and the front of the aeroplane dips, almost straight downward. To the spectators it appears that it is dropping sheer to destruction, but just before it reaches the ground the aviator gives his lever another turn, rights his machine dexterously and alights safely. This method of landing is known as the volplane and is now practised even for pleasure. A safer way to volplane is to make the machine circle as it falls, which enables the aviator to choose his landing place.

On the other hand many dangers that were feared by the beginners have turned out to be no dangers at all. For six years no aviator would venture up if more than a breeze was blowing. Then one day, an Englishman, called Latham, forced his machine up into a fierce gale of wind. For a few minutes it fluttered dangerously against the gusts, then turned and sped down wind at the rate of ninety miles an hour. Back again came the daring aviator, making scarcely any progress against the fierce air currents. After ten minutes he alighted safely, having proved that the aeroplane is a good weather craft.

An aviator flies over the Alps

The following year Chavez, a Peruvian, astonished the world by flying over the Alps and though he was killed by a bad landing on the other side he had demonstrated that the mightiest strongholds of the air could be conquered. There is, in fact, no limit to the height to which an aeroplane may ascend, but when the aviator reaches an altitude above two or three miles the thinness of the air causes him to become dizzy and ill. The cold, too, is intense high up in the air, yet aviators have succeeded in rising about six miles. It is claimed that much higher flights have been made.

At first long distance flights were impossible because the aeroplanes were not strong enough to carry much fuel for the engines. But gradually this difficulty was overcome. One of the first long distance flights was performed in 1911 by C. Rodgers, an American, who flew from New York to Kansas, 2,600 miles, though with many stops and much work upon his machine.

Record after record is broken

Two years after, the record established by Rodgers was broken by Hélen, a Frenchman, who covered 13,000 miles in thirty-nine days. It is now possible for a machine to stay up longer and continue day after day. Flights from London to Paris and cities in Germany without alighting became quite common. There is a story told among English aviators of Herr Etrich, an Austrian flier, which gives an illustration of the speed with which an aeroplane may fly from one country to another.

Herr Etrich came to the aviation grounds outside London in a cab, which he forgot to discharge as he left it. After waiting some time the cabman became impatient and proceeded to make inquiries for his late passenger among the people on the aviation grounds.

"Why, he's in France," laughed one of the aviators; "we've just had a telegram from him announcing his arrival in Calais."

In the early days forty or fifty miles an hour was considered high speed for an aeroplane. To-day it is possible to go at the rate of 125 miles an hour and, with the wind in favor, 150 miles an hour, or even more, has been attained.

Presence of mind is necessary for aviators

Presence of mind is the most necessary quality for one who wishes to fly. If only the aviator does not become frightened, an accident rarely happens. So perfected is the aeroplane of the present time that the aviator has almost perfect control over its movements. In fact, an aeroplane will fly upside down as well as in upright position.

A few years ago a Frenchman was

flying on a windy day when his machine was overturned by a sudden gust. He continued his flight for some three hundred yards, upside-down. Fortunately he was at a good height and strapped in. Finally he righted his machine and landed safely. A few months later another Frenchman, Adolphe Pegoud, overturned his machine deliberately and flew in circles; looping the loop. Now that is quite a common trick. One aviator who has performed it repeatedly says:

"In looping the loop, when you start the turn, you seem to sit still and the whole world revolves around you. The horizon disappears under your feet and next you see it coming back over your head. The whole thing is done so quickly that you don't realize for a moment what has happened. There was no unpleasant sensation except a rushing of the blood to the eyes."

In the great European War workshops to repair aeroplanes accompanied the armies. Here we see French machinists and aviators at work while above floats one of their machines which has a record of 125 miles an hour. This car is armored underneath to protect the aviator.

Picture copyright, Underwood and Underwood, New York.

MEN LOSE THEIR SENSE OF BALANCE IN THE AIR

It is a peculiar fact that when up in the air men partly lose their sense of

balance. The aviator knows when his machine tips backward or forward, but not when it tilts to one side or the other. To keep his level he carries a small instrument, made on the same principle as a spirit level, which is a surer guide than his own senses. The earth below also helps him to realize his position. For this reason the aviator dreads running into a fog. Then he loses all sense of direction.

It will not seem strange that the first practical use to which the aeroplane was to be put should be for purposes of war. What could be more valuable to a general than to be able to rise a mile into the air and observe the movements of the enemy over the country spread out below him, like a map?

THE GREAT IMPORTANCE OF AEROPLANES IN WAR

This is actually what was done in the Great War. Every army had attached to it what is known as the flying corps, hundreds of skilled aviators. Some of these daring scouts were the same men who gave exhibitions of skill in the early days but special schools were maintained by the military authorities in which to train aviators.

War planes are divided into three classes: combat planes, observation planes and bombing planes. The combat planes were small and very swift, generally carrying only one person but sometimes two. The machine gun was often arranged to shoot between the blades of the propeller as it revolved. The aviator attacked other planes, or attempted to shoot down the observation balloons of the enemy. Of course he made observations as well. The observation plane usually carries an observer as well as a pilot. It is slower and steadier and carries cameras with which photographs of the enemy's position might be made. Such planes also carry machine guns for defense. The largest bombing planes can carry a ton of bombs which are to be dropped upon forts, camps, railway stations, or ammunition depots. Often several of these went out together.

In the gray of early dawn the scouting aviator rises out of camp in his machine, describing wide circles as he ascends at least a mile. Sometimes he is alone, sometimes he has with him a companion, seated in front with nothing to do but observe what is going on below. Then, suddenly, the machine swoops forward and darts over above the trenches, into the enemy's territory. Immediately the enemy's anti-aircraft guns begin popping, sending bursting shells five miles upward while rifles crack with a continuous roar.

Sometimes aeroplanes from opposing sides will meet up in the air and then comes the aviator's real danger. They begin swooping and circling around each other, each striving for advantageous position. Then they begin firing their rifles or machine guns at one another until one or the other gets the advantage. Pegoud, the Frenchman who first looped the loop, fought many such duels.

With the improvement of the aeroplane men began to dream of crossing the Atlantic, and within two months, in 1919, this feat was accomplished three times, twice by heavier than air machines, and once by a dirigible balloon which made the round trip.

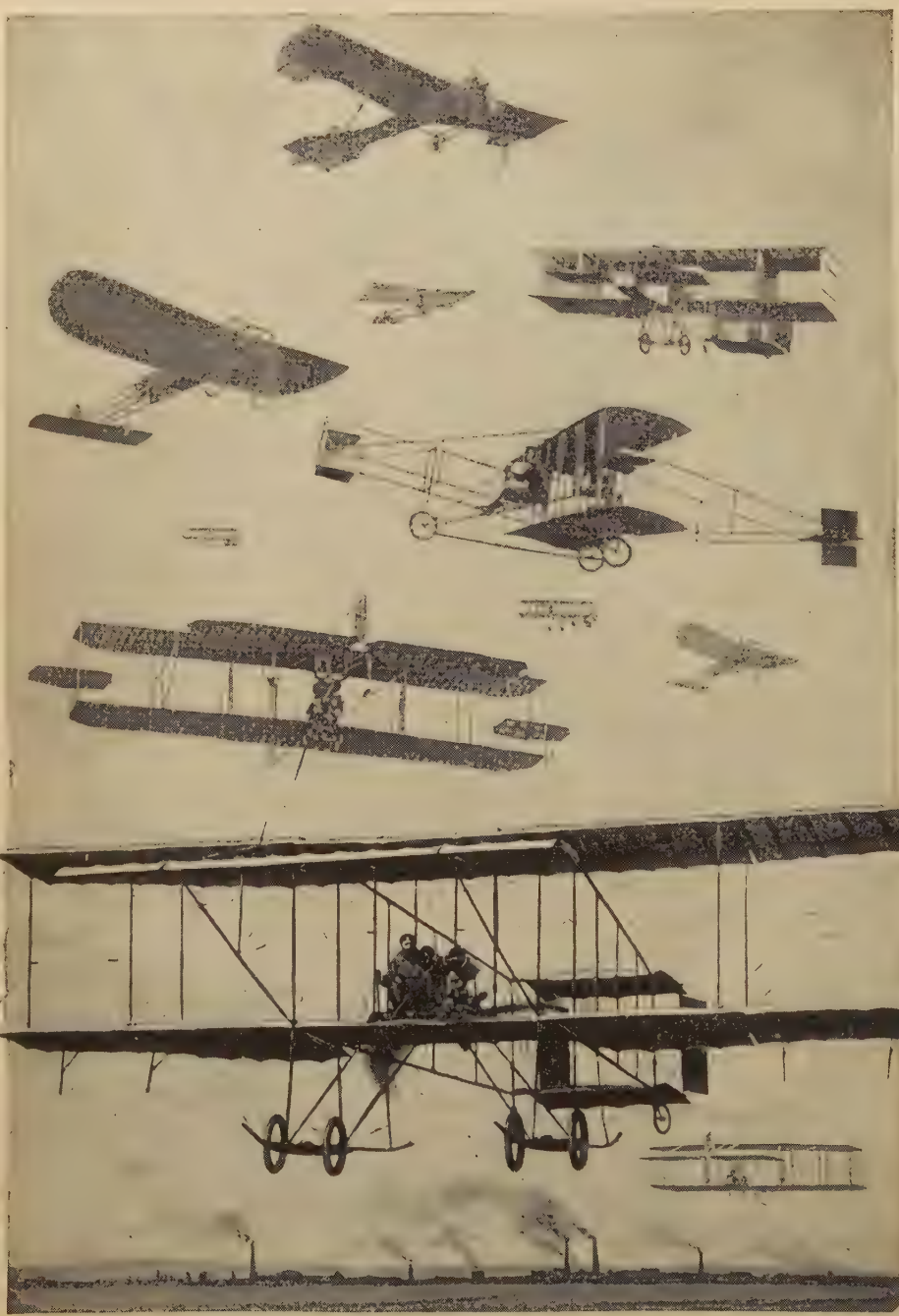
The first successful flight was that of the NC-4 (Navy-Curtiss), a flying boat constructed according to plans worked out by the United States Navy and Mr. Glenn H. Curtiss. The trip was made by a series of jumps; from New York to Halifax, to Newfoundland, to the Azores Islands, to Lisbon, to Spain, and then to Plymouth, England. Three of these boats started, but two were forced to come down in the sea. Only the NC-4, commanded by Lieutenant Commander Albert C. Read, completed the journey, May 27, 1919. The longest jump from Newfoundland to the Azores, about 1,200 miles, was made in fifteen hours and eighteen minutes.

Hardly had the wonder of this flight died away when Captain John Alcock and Lieutenant Arthur Brown, in a British plane, flew from Newfoundland to Ireland, 1,980 miles, in 16 hours and 12 minutes, completing the journey on June 15, though much disturbed by fog. Three weeks later the British dirigible, R-34, made the journey from Scotland to Mineola, Long Island, 3,200 miles, in 108 hours. After resting a few days, she successfully accomplished the return journey. Probably crossing the ocean will become a common occurrence soon.

Several nations are using aeroplanes to carry mail, and perhaps soon we shall have regular lines running on schedule which will carry passengers for hire.

THE NEXT STORY OF FAMILIAR THINGS IS ON PAGE 189.

THE NEW CHARIOTS OF THE SKY



Thousands of years ago man conquered the land and the sea, but the conquest of the air is only now being realized. It is true for more than a century men have gone up in balloons, but these have always been at the mercy of the winds; although many balloons or airships that could be steered, provided the winds were satisfactory, have been made in recent years, there is always an uncertainty about a balloon. It is the aeroplanes that have brought the conquest of the air within measurable distance of achievement. We here see some of the kinds of aeroplanes that have made successful flights. No. 1 is Mr. Hubert Latham's Antoinette aeroplane with which he nearly flew across the English Channel; No. 2 is the Voisin biplane; 3 is the monoplane in which Bleriot flew from France to England; 4 is an early Curtiss biplane; 5 is Colonel Cody's aeroplane; and 6 is an early Farman biplane. Newer models differ somewhat.

FLYING OVER NEW YORK HARBOR

On the morning of May 29, 1910, Mr. Glenn H. Curtiss left Albany in an aeroplane of his own construction, and mounting several hundred feet into the air, flew down the Hudson River to Governor's Island, New York. He made two stops during his trip to fill the gasoline tank and look over his machine. Including the time lost in these two stops he made the trip in exactly three hours and twenty minutes. This was one of the most successful long distance flights up to that time, though it seems short and slow compared with what has been done since, in America and Europe. Mr. Curtiss has constructed many aeroplanes since.

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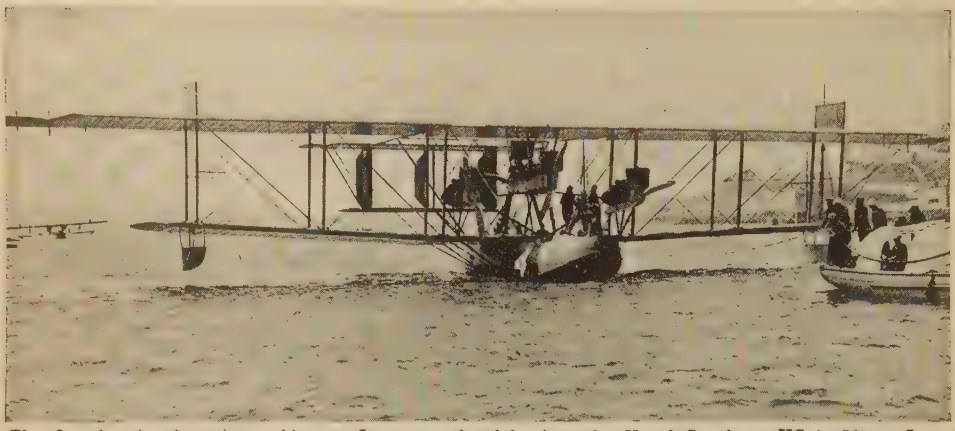
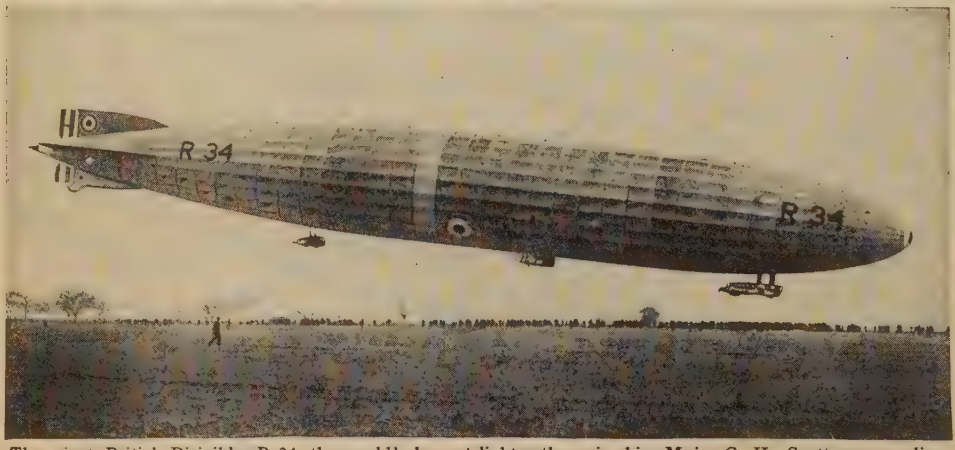
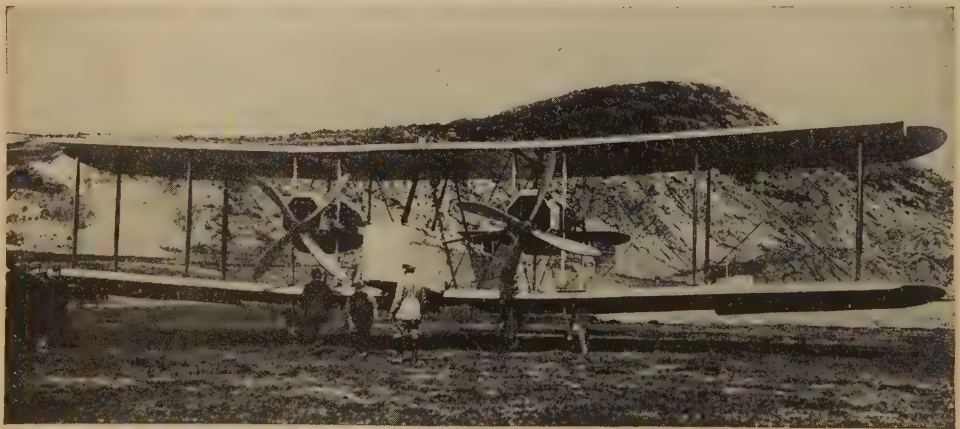
THREE TYPES OF MODERN AEROPLANES



The first heavier-than-air machine to fly across the Atlantic — the Naval Seaplane NC-4. Lieut. Commander Albert C. Read, U. S. N., commanding — started from Rockaway Beach, New York, via Newfoundland, stopped at the Azores Islands (1,200 miles), and at Lisbon, touched the coast of Spain, and landed at Plymouth, England, May 31, 1919, completing a flight of four thousand miles.



The giant British Dirigible, R-34, the world's largest lighter-than-air-ship, Major G. H. Scott commanding, completed the first transatlantic non-stop flight from East Fortune, Scotland, to Roosevelt Field, Mineola, Long Island, 3,200 miles, on July 6, 1919, and returned to her base.



The Vickers-Vimy bomber, with Captain John Alcock, pilot, and Lieut. Arthur W. Brown, navigator, made the first non-stop transatlantic flight of 1,980 miles from St. Johns, N. F., to Clifden, Ireland, in sixteen hours, twelve minutes, landing June 15, 1919. She encountered fog, gales and thunderstorms.
Pictures, Copyright, Underwood & Underwood, N. Y.

A FLYING BOAT FOR THE UNITED STATES NAVY

This rather puzzling machine is a flying boat for the United States Navy, as you can see from the tag on the front. It is being constructed in the workshops of Glenn H. Curtiss after a design by that skilful airman, who has done more than any one else to develop the idea. It has double propellers, and very powerful engines, which will enable it to rise rapidly and fly swiftly. The use of flying boats is just beginning to be appreciated. Doubtless they will be used much more in the future.

Picture from Press Illustrating Service.

A HYDROPLANE AFTER MAKING A SUCCESSFUL FLIGHT

Aeroplanes intended for use over water are called hydroaeroplanes, or hydroplanes. They are often carried on battleships, and are sent out to gain information of the effect of attacks upon fortifications, or of the presence of enemy ships. This one had alighted and was being towed back to the ship. Notice the boats which prevent the plane from sinking. It had made a flight over the Turkish fortifications, and a heavy fire had been directed at it, but no serious damage had been received.
Underwood & Underwood, N. Y.

WHAT THIS STORY TELLS US

WE know that life is something more than liveliness, and that a thing may be alive even though we cannot see it move. We shall now try to find out how life began. Once upon a time there was no life on the earth, which was too hot for anything to live upon it. But as the world cooled, life began in the coolest part of it—that is, in the sea, and the first living thing, perhaps was the seaweed. We are quite sure, at any rate, that the first living things were plants, because plants are the only things that know how to obtain food from air and water. Every living thing must have one thing to live upon—a kind of gas called oxygen, and plants feed on the oxygen, which they take in by breathing. Then the animals, and we ourselves, live upon the plants, and without plants not one of us could live. No man has ever been able to draw life straight from the air as the plants can do. We can only guess at the manner in which God has worked.

HOW LIFE BEGAN ON THE EARTH

CONTINUED FROM PAGE 70

WE want to find out what it is that makes us call some things living and others not living; and we have agreed that our best plan is to look at the simplest kinds of living things, which are plants, and to learn from them. Another reason why we should do this is that in the story of life plants came first, and so we are beginning at the beginning.

All wise men are sure that there was a time when there was no life at all upon the earth—no animals, not even any plants, whether on the dry land or in the sea. Indeed, there could not then be any life, because the things that life needs were not to be found. Many wonderful things happen in a fire, but there is never any life in fire—it is too hot. And the dry land of the earth was once too hot for any life to be on it, just as a hot cinder is. As for the sea, it was also so hot as to be nearly boiling, and it is not possible for any life to exist in boiling water.

A little while before, the water that now makes the sea was so hot that it actually hung in the air in the form of what is called water vapor, and only when the hot earth became a little cooler did most of the water in the air turn liquid and fall in a great shower of the first rain that ever was into the low-lying parts of the earth's surface—the parts that we now call the bed of the sea.

Well, in all the sea, and in all the air, and on all the dry land, there was nothing that did what a plant can do—nothing alive. Then, at last, as men think, when the water far down in the sea became cool enough—cooler, of course than the surface water upon which the hot sun shone all day—the first living things, the smallest and simplest kinds of plants, came to be. We need not ask ourselves exactly what those first plants were like, because all kinds of plants are really the same, and so it will do just as well if we take some kind of plant that we all know, and look at it. Grass will do very well, only we must think of it as living in water, like seaweed.

Now, grass, like all living things, plants and animals too, *breathes* and *feeds*, and *grows*—and dies. Wherever you had looked throughout the whole earth before the time we are speaking of, you would have found nothing that did these things—nothing *alive*. But when we find something that breathes, as you are breathing at this minute, and as I am breathing, and as every blade of grass on earth, every flower and fly and fish is breathing—then we know that it is alive. If

it breathes it must feed; this feeding makes it grow when it is young; and at last it must die. These, then, when we find them, are the proofs of life.

And now let us look more closely at the life of the plant.

WHAT WOULD HAPPEN IF ALL THE PLANTS IN THE WORLD WERE KILLED?

Of course, no plant, no tree or flower, can ever be so interesting, in itself, as an animal. Even a humble animal like the goldfish, which you may keep in a bowl of water in the drawing-room, or even a mere fly, has something about it that seems to make it more wonderful than the most splendid tree. It is all very well, for instance, to say that a cabbage is alive, but how very dull and stupid and half awake is that sort of *vegetable life*, compared with the animal life of even a lazy caterpillar that crawls over that leaf, and especially compared with a butterfly!

Now, I quite agree that animals show life in its most striking way, and that there is a great gap between the stupid, silent, rooted cabbage and the lark singing and soaring in the sky above it. And yet vegetable life was the first life, which had to exist before any animal life could be at all; and even to-day all the animal life in the world, including the life of our own bodies, entirely depends upon vegetable life. If all the plants in the world were killed, in a few short days every animal, every bird in the air, every fish in the sea, and every man, woman, and child upon the earth would die also.

Even though animals can fly and jump and sing as plants cannot, yet plants can do wonderful things which animals cannot, things, indeed, which make it possible for animals to do all that they can do.

NO MAN CAN DO WHAT A BLADE OF GRASS CAN DO

The life of the plant is so wonderful in what it does that even to-day, after hundreds of years of thinking and studying and adding new knowledge to old knowledge, men cannot do, even with wonderful machinery and electricity and all their discoveries, the things which the smallest blade of grass does all the day without "trying," without thinking about it, or making any fuss at all! Possibly men may some day learn how to do the things that the plant now does for us and for all animals; and perhaps, after a long time, men may become so clever that, with great trouble and much preparation, and great noise and planning and expense, they may be able to do so well what plants now do for us that it might be possible to do without plants altogether; but I really do not think that that time will ever come. Even if, after thousands of years, we learnt to do what plants can do, we could never do it so easily and cheaply and quickly and well as they do. We can never beat perfection, and the way of the plants is perfect.

Now, what is it that plants do so well, and animals cannot do at all, but yet cannot do without? Animals breathe and grow and feed just as well as plants, and sometimes even more quickly; but the great difference is that plants can feed on anything, so to speak, whilst animals can only feed on what plants have made for them. You know, perhaps, what a vegetarian is—someone who eats vegetables or plants, but not the flesh of animals. Now most animals are really vegetarians. Even if we eat beef, the ox had to eat grass. It is from grass that the ox made the beef we eat, and if there were no grass, where would beef come from?

THE MARVELOUS THING ABOUT PLANTS IS THAT THEY EAT ALMOST ANYTHING

Now, we see how important this is if we remember, that every living thing must eat or die. When we say "eat," you think of putting something into your mouth and biting it; but many living things have no mouths, and yet they certainly eat. If we say they *feed*, that will be better. That is one of the great differences between what is living and what is not living. If a fly, or a man, or a blade of grass, gets no food it will die; but a stone will remain just the same for hundreds of years without any need of food. The stone is not alive. That shows us how important is the great food question.

And the marvelous thing about plants is that they feed on almost anything, on things that are not alive, and never have been alive, whilst animals can only feed on *them*. Both the animal and the plant may be starved, and then both will die;

but the animal having air and water and lifeless earth will die of starvation, whilst for the plant these lifeless things, with which the animal can do nothing, are a rich and plentiful feast.

We see, then, why we can be sure that the first kinds of living things were plants. No kind of animal could have been first, because there is no kind of animal that can feed itself without the help of the plant. When life first appeared on the earth, there was nothing for it to feed upon but lifeless things, like air and salt and water; and the only kind of living creature that can live on such things is the plant.

PLANTS LIVE NOW EXACTLY AS THEY LIVED MILLIONS OF YEARS AGO

Now, what plants did at first they do still. This is very interesting if we think what a great difference there is between those first simple plants, with their short lives and tiny bodies, and the great tree of to-day. Yet these trees, different in so many ways, living for hundreds of years, and sometimes so large that you could drive four horses abreast through the trunk of one of them, feed in just the same way as the first plants that were formed at the bottom of the sea ages ago. It is just because the little plants of long ago and even the biggest trees of to-day do their feeding and growing and breathing in the same way that we group them together, calling them all plants, and giving the name of *vegetable life* to that which they all show.

Life began in the sea, and the first living thing, perhaps, was seaweed such as we find on the beach.

Now let us see the way in which plants have become more wonderful since the beginning, and then, after we have seen what the story of plant life has been, we can look more closely at the way in which it serves us.

If we dig down very deeply into the earth we find ourselves passing through the first layer to another layer of a different kind, and then to another and another, and so on. We know that these different layers, lying below the one that we live on, were once at the surface, or the "top," and then have been covered up; and so as we dig down, and find remains of different kinds of animals and plants, and proof that they once lived in one layer or another, we can tell something as to what the story of life has been on the earth. This is most important and interesting so far as the story of animal life is concerned, and men have been studying it carefully for many years. We shall have to talk about it later. It is only a very few years, however, since men began to understand the history of plant life as it is shown in the record of the rocks. Of course, you can guess a good reason why it is so much more difficult to find out what the plants of long ago were like than to tell the story of animals of long ago. Nearly all animals have *bones*, which are hard things, and may last for ages, or at any rate leave marks that last for ages. It is not so easy for a plant to be preserved, because most of it is soft, and the oldest plants were altogether soft. However, we have learned a great deal about the history of plants quite lately. And this is what we find: If we dig down far enough, we come to layers of the crust, or shell, of the earth that have no signs of life of any kind, whether animal or vegetable. Above these layers we begin to find the first records of the story of life—records of vegetable life and of animal life.

THE VERY FIRST THINGS THAT LIVED ON THE EARTH

You can guess, perhaps, what kind of plants those first ones were. There were no trees or flowers, but there were plants rather like seaweed, and also simple plants of a very humble kind that were close relatives of simple plants of to-day, like the mushroom and the toadstool. Those men who know most about this matter are also sure that near the very beginning of life there were to be found the kinds of plants which we now call

microbes, some of which are apt to enter our bodies now and make us ill. Then, again—and this is very interesting—we have sufficient proof to make sure that, at the very beginning, or at any rate as soon as there was any animal life at all, there were green plants—the simplest kind of green plants. Now, it is easy to tell you why this is so important. It is the green stuff in the plant, as we shall see in a very short time, that makes it able to feed upon the air, as animals cannot do; and therefore, so soon as we find any traces of animals, we should expect also to find traces of green plants, for we are assured that, without green plants, there would have been no animals at all.

THE GIANT FERNS THAT GREW LONG AGO AND HAVE NOW TURNED INTO COAL

So, when we do find traces of green plants as soon as we should expect to find them—that is to say, at least as soon as the first animals—we are well pleased. As long as we could not find plants so soon as that, we were puzzled to understand how animals could live at all.

Then, higher up, later in history, and nearer our own days, we find evidence that plant life was becoming richer, and the bodies of the plants becoming bigger and more powerful. This stage is the stage of the *ferns*, and in those days everything seems to have been just exactly right for the life of ferns, which flourished richly for a long, long time. They became very large, too—giant ferns, such as we cannot see nowadays—and the age through which they lived must have been a very long one. The remains of these are now changed into coal, and very useful we find them to-day all over the world.

THE TIME WHEN THE FLOWERS CAME INTO THE WORLD

But all this time there is no sign whatever of what are called the higher plants; that is, there were no trees, no flowers, or, to use a general sort of word, there were no *flowering plants*. Perhaps you think that flowering plant is a funny word to apply to a tree, because, though you know many kinds of trees that bear flowers, perhaps you think you know many other kinds that do not; but, as a matter of fact, all trees bear flowers, without a single exception, and all trees are just the largest and most wonderful kinds of flowering plants. It was not until long ages after the time of the ferns that the flowering plants appeared.

When this new kind of vegetable life appeared, it soon made room for itself. Many of the kinds of plants that had a good time of it before died out, either altogether or very nearly. The flowering plants were cleverer than any of the older kinds; they were fitter to live in the world that they found around them, and so they succeeded. Just as animals with backbones are the masters of the animal kingdom, so the plants that bear flowers are the masters of the vegetable kingdom. They have not entirely destroyed all the older kinds.

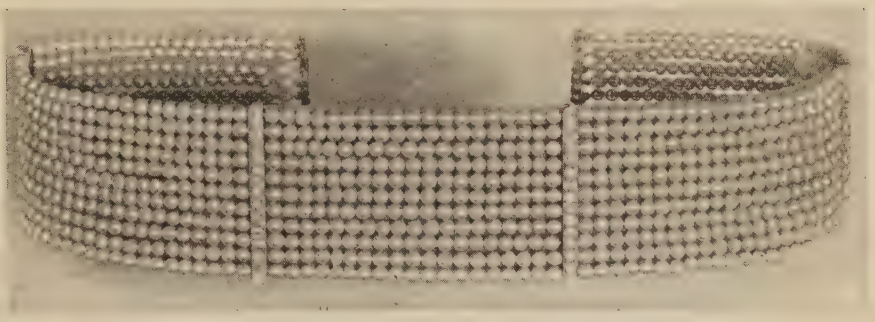
We can still find living plants of lower kinds, which are really not very different from many of the plants found deep down in the earth, and which lived at a time when there were no flowering plants at all. But, still, the story of the plants is a story that leads steadily up from very small beginnings to the flowering plants, including all the mighty trees, and nearly all the other kinds of plants are, so to speak, just allowed to go on living; the flowering plants are the masters.

THE PLANTS LEARN NOTHING NEW, BUT LEARN TO DO OLD THINGS BETTER

But with all these changes and through all this long history, certain great powers possessed by the earliest plants, and certain things in the way they are made, have gone on, and the only difference has been that, age after age, plants have learnt to make more and more of these powers; so that, if the great trees have beaten the ferns and mosses, it is only because they have learnt to do in a better way what the mosses and the ferns have long been doing not quite so well.

As we shall see, this is not the case with animals. During the ages they have learnt to do new things, and have made fresh powers for themselves, some of them so wonderful that we can scarcely guess how they came; but the vegetable world has merely learnt how to do better the things it has been doing from the first. So far as their long history is concerned, this is the chief difference between animals and plants.

THE NEXT PART OF THIS IS ON PAGE 243.



HOW AN OYSTER MAKES A PEARL

CONTINUED FROM 184

THE oyster, with its hard, rough shell and its soft, flabby little body, is not a beautiful thing to look at, but it gives us one of the most beautiful things in the world. From the oyster we get the pearl.

How does the oyster get its pearls? It makes them in the strangest way. When the oyster is a tiny thing it floats about on the top of the sea, without any shell, just like a little piece of jelly. But when the shell begins to grow, the oyster gets too heavy to swim, and has to sink down to the bottom of the sea. It is quite happy there. It fastens itself to a rock or to something else, and opens its shell and lets in the sea-water, which has in it the little things which the oyster eats to make it fat and big.

But sometimes it gets more than it wishes to have. A tiny speck of sand enters the shell and presses against the oyster's body. Perhaps it may be the egg of a fish or a tiny speck of a sea insect. The poor oyster cannot get it out; but, as it cannot bear to be tickled by whatever it is which has got into its shell, it sets to work to cover it over and make it smooth.

Then something very wonderful happens. From the oyster's body there comes a fluid, which covers the speck, or whatever it may be. The fluid hardens. Then there comes more and more fluid, layer upon layer of it. This also becomes hard, and in time the little parasite is changed into a lovely pearl. It has grown bigger and smoother as the fluid has settled on it, just as a snowball grows. This is the sort of pearl that ladies wear in rings or in bracelets. But there is another sort of pearl. This is the lining of the oyster-shell. It is called mother-of-pearl, and is used to make ornaments and buttons and the handles of knives and forks.

The oyster's shell is very rough outside, but he must have a smooth bed on which to lie, and so he sends out his fluid to harden and to coat the inside of the shell smooth and beautiful like the loveliest enamel, only better.

The best pearl-oysters are found off parts of the coast of Australia, New Guinea, Borneo, the Philippine Islands, and Ceylon. They are brought up out of the sea by brave divers, as the pictures on the following pages show.

Some of the divers who are able to catch an oyster with its shell open drop little things in to become coated with pearl. There are in the Natural History Museum, in South Kensington, London, a collection of shells into which the Chinese put some figures of little idols. These idols are now quite coated over with mother-of-pearl. The outside of the shell wears away in time, until the inside becomes the outside. But as the outside wears away, the oyster keeps building up the mother-of-pearl inside, so that the shell shall not become thinner or less safe for his home beneath the sea.

THE PEARL-DIVERS READY FOR WORK

This picture shows a pearl-fishing fleet at anchor, ready to set sail. Fishing for pearls in Ceylon and India is permitted for only a few weeks in each year, always in March and April. A boat carries the divers to the fishing grounds, usually setting out at midnight, so that the divers can begin at sunrise.

These two pictures show the diver ready to go down and at work at the sea-bottom. The curious thing on his nose is a piece of horn, which closes his nostrils, so that water cannot enter while he is diving. When the diver is ready, a man in the boat holds a rope having a large stone at the end. The diver stands on the stone, and is then let down into the sea. He remains under water for about a minute at a time. If he were to remain much longer he might be drowned. The diver must beware of sharks, and usually carries spikes to defend himself. He puts the oysters into a net and brings them up.

Many pearl-divers work with no protection except the simple arrangement to close the nostrils which is seen in the previous picture. They remain in the water only a very short time, and must return to the surface to breathe. The curious diver's dress shown here enables men to breathe at the bottom of the sea, so they can stay below much longer. The chief part of the dress is a large helmet, covering the head completely, and having attached to it a tube leading to the surface. The men in the boat pump air into this tube, so that the divers below can breathe. The front of the helmet is glass, so that the diver can see to work.

BRINGING THE OYSTERS TO SHORE

The pearl-divers work from about sunrise to noon, when the boats set sail for shore again. Here the boats have returned to shore and are landing the oysters, which are carried on shore by the divers.

This picture shows one of the sheds into which the oysters are carried, and the baskets into which the oysters are put. The men are merchants who come to buy the oysters. If they are fortunate enough to find many pearls in the oysters they make a great deal of money, but if there are not many they may lose money.

LOOKING FOR THE PEARL IN THE OYSTER

This man is opening a pearl-oyster, and we can see the long knife he uses. He has found a beautiful pearl as big as a large pea, and it may be seen at the point of the knife. On his left in front are the oysters he has opened, and on his right are those he has still to open, which may contain precious pearls.

THE PEARLS READY FOR THE MARKET

These men are opening the oysters in the hope of finding pearls in them. If the pearls found are large they are valuable, but small pearls are not worth much money. Very tiny pearls are called seed pearls.

Pearls are too precious to lose or waste, and these men are seen looking in the oyster refuse and the shell-dust for any small pearls that may have been lost. Only very small pearls are ever found at this stage.

This does not look like a jeweler's shop, but it is one. The men are weighing the pearls and sorting them out according to size, color, and shape. The most precious pearls are the largest and best shaped. The wonderful story of how pearls are made by oysters and found by pearl-divers is told on page 189.

THE NEXT FAMILIAR THINGS BEGIN ON PAGE 237.

A STORY OF THE REDSKINS

THERE is no more picturesque figure in modern romance than the American Indian. Fenimore Cooper, whose life-story is told in this work, became famous for his stories of adventure among the Redskins, and this is one of his best-known tales told over again as a short story. Cooper wrote this romance of the American wilderness in 1826, at a time when the Indians were still fairly numerous, often taking to the warpath against the white settlers, and having their encampments even in the Great North Woods of New York; but now the race is greatly reduced, and the "noble red man," as described in romance, will ere long have entirely disappeared from his native scene.

THE LAST OF THE MOHICANS

CONTINUED FROM 78.

IT was summer-time in the year 1757, when the American colonial forces were carrying on a war with the French, then masters of Canada. Always subject to attack by the different tribes of Indians, who were still numerous and formidable, the American colonies were at this time more disturbed than ever, as war between the French and the British also involved outbreaks with the Indians, some of the Canadian tribes taking to the warpath and coming down into the British colonies. Danger lurked everywhere; even the townships were not secure from attack.

But one day, in the still beauty of July, three strange and picturesque figures made part of a striking scene in the American wilderness—a scene so peaceful to look upon that one might never have guessed how near to the most exciting adventures all three were. On the high bank of a swift and swollen river the men were grouped in attitudes of ease. The dull thunder of a waterfall told that the river had come down from the higher land at no great distance away, with a tremendous fall that now sent the water boiling and churning between the steep banks.

Of the three, there were two whose dark, ruddy skins and paint-bedaubed features and bodies, with their picturesque costumes of skins and feathers, betokened them natives of these wild lands of the West. One was older than the other, for, indeed, they were father and son. The old Indian was Chingachgook, known as the Great Serpent, the sagamore, or tribal chief, of the Mohicans, the remnant of a tribe of the Delaware Indians. He had all the dignity and alert bearing of an Indian chief, though his body had no longer the supple beauty and suggestion of boundless energy of his son, Uncas, known as the Bounding Elk.

The third person of this little group wore a green hunting-shirt and Indian moccasins, and there lay across his knees a rifle of unusual length, the trigger of which he fingered from time to time. Almost as dark of complexion as his companions, by long exposure to the sun, it would have been difficult to tell him for a white man; but such he was, and his name was Nathaniel Bumppo. To the Indians, however, he was always known as Hawk-eye, while his fame as a fearless scout and hunter was known to the French enemies, by whom he was usually spoken of as Long Rifle.

The three men were talking quietly, and, though they showed no uneasiness, they were evidently on the alert, for they knew that General Montcalm, the French leader, was even then making his way through the far-spreading forests, over which their position gave them a splendid view, on his way to invest the British in Fort William Henry, on Lake George, which was only a few leagues away from the scene. Suddenly the

old Indian, laying his ear to the ground and listening intently, exclaimed: "The horses of white men are coming!" Quickly taking cover, they had not long to wait before the cavalcade came into view. It consisted of a British officer, who wore the uniform of a major in the colonial service, and beside him rode two beautiful young women, one fair-haired and blue-eyed, and the other bewitchingly dark. They were accompanied by an Indian guide and a strange, gaunt creature of unkempt appearance. Hawk-eye's voice rang out in challenge as he presented himself to the little group, and it was with evident relief that the officer answered him.

"I am Major Duncan Heyward, and these ladies are the daughters of Colonel Munro, who is in command at Fort William Henry, whither we are bound. Unfortunately, our Indian guide has lost his way, and we should be glad if you could help us to regain it."

BETRAYED BY THE REDSKIN, AND A PERILOUS JOURNEY IN A CANOE

This was enough for the hunter to know that the Indian had betrayed the party. "An Indian lose his way!" he said scornfully, as he made a sign to his own companions, who immediately slipped into the bushes to cut off the false guide. But with a wild shriek the guide bounded away, and succeeded in eluding them.

It was clear that the travelers had been betrayed, and no time was to be lost if they were to escape falling into the hands of cruel Indians, for the guide was known as a chief of the Hurons, enemies of the English. Dusk was gathering, and there was no hope of reaching the fort that night, so Hawk-eye led the four strangers down to the river's edge, giving the horses over to his Indian companions, and from a place of concealment drew forth a frail birch-bark canoe, in which the travelers took their seats with no little difficulty, as it was overloaded with five persons. Only the marvelous skill of Hawk-eye and his calm steering through the surging water against the current saved them all from drowning. But it was their only hope of escape, and the four people sat in the canoe scarcely daring to breathe, while Hawk-eye coolly impelled it forward by his dexterous and powerful strokes of the paddle. Meanwhile the two Mohicans led the horses into the water and took them up-stream some considerable way to a little cove, where they would not be readily discovered. Thus, by walking the animals through the flowing water, no trail was left for the Iroquois to follow.

A STRANGE HIDING-PLACE UNDER A WATERFALL

It was black night when Hawk-eye at last brought the canoe with amazing skill into a little space of quiet water that lay alongside a rocky island over which the great waterfall descended like a mighty screen. Even when they had stepped on to the island, the travelers were still afraid to move, being in terror of the darkness and the deafening thunder of waters. There they stood, scarcely daring to exert a muscle, while the hunter shot away rapidly in his canoe to bring back the two Indians and a store of venison from their cache, or hiding-place. He seemed to be gone only a little while when he was back with his companions, and contrived to make the travelers comfortable for the night.

Hawk-eye scarcely hoped that their hiding-place beneath the waterfall would escape discovery, and he had only chosen it the better to withstand an attack from the Redskins, which, sure enough, was made soon after dawn next day.

But the favourable position, and the cavernous nature of the island on which Hawk-eye had placed his party, together with his great skill as a shot, in which the two Mohicans were very little inferior, kept the savage Redskins at bay until another night had come.

CAPTURED BY THE HURONS, BUT RESCUED BY HAWK-EYE AND THE MOHICANS

The situation was now desperate. Their powder was done, and the next morning would see them all shot or captured. A little council of war was held. It was decided that the scout and the two Mohicans should slip into the water, reach the bank, and make their way to the fort in the darkness, returning at once with a rescue party. All agreed that the Redskins would make captives of the others in the morning, and it was necessary that the rescue party should be as strong as possible. Next morning the Hurons returned to the attack, and, meeting with no opposition, made their way to the hiding-

place, where they found Major Heyward and the two girls with the fourth member of the party, who had described himself as David Gamut, a singing-master, attached to a Connecticut regiment, and who was really not quite sane. Instead of scalping his victims, Magua —for such was the name of the false guide—decided to take them captives, and as David Gamut insisted on singing a funeral psalm when he was captured, the Indians left him practically at liberty, believing, like many savage people, that persons of disordered minds are under a special protection. The real reason of Magua's betrayal was to be revenged on Colonel Munro, at whose orders he had once been flogged.

Happily, Hawk-eye and his companions, replenishing their powder from a secret store, had boldly started back on the trail without going to the fort, and in the nick of time overtook the Iroquois on the march with their prisoners, putting Magua and his braves to flight and releasing the captives.

THE FALL OF THE BRITISH FORT AND RECAPTURE OF THE COLONEL'S DAUGHTERS

The little party then pushed on towards Fort William Henry, and when they drew near they found that Montcalm's troops had begun the investment of the place. By good fortune, one of the mists that rise suddenly from the lake came on, and Hawk-eye, knowing the land so well, was able to lead the party through the French lines unseen, to the great joy of old Colonel Munro, who had made every preparation to defend the fort against the enemy.

How bravely the old Scottish warrior and his small garrison, chiefly composed of the "Royal Americans," the regiment in which Heyward was major, defended Fort William Henry against the overwhelming forces of Montcalm is told in many a history of these old colonial days. The end of it all was that Munro and his garrison had at last to surrender, but they were granted the privilege of marching out with the honours of war and a safe conduct to Fort Edward. This proved a hollow promise, as they were attacked on their march through the forest by some two thousand Indians, who were attached to Montcalm's army, and a general massacre took place. Magua had also seized the occasion to reappear with a small band of Hurons, and, in the confusion that followed, he succeeded in carrying off the sisters and the half-witted singing-master.

ON THE TRAIL OF THE INDIANS, TO THE RESCUE OF THE CAPTIVES

Colonel Munro and Major Heyward, as well as Hawk-eye and the two Mohicans, managed to escape from the fray, and, Uncas, being certain that Cora and Alice had been taken captive by the Hurons, it was decided to make for the Great North Woods, in the hope of rescuing the girls, as in that district of the American wilderness the Hurons had an encampment. The Delaware Indians were also encamped there, and the Mohicans were of the same race. Day after day the little party of five followed the trail into the depths of the wilderness until they felt they were nearing the Indian camp.

Emerging cautiously from the wood through which the trail had led, they saw below them a colony of beavers at work in a stream. A strange figure stood there watching the busy little animals. This was none other than Gamut, the singing-master, whose attention the party cautiously attracted, and they learned from him that Alice was a prisoner among the Hurons, whose camp was some two miles off, while Cora had been placed in the keeping of the Delawares ten miles away. So far the captives had suffered no harm, but what fate was in store for them, who could guess? Gamut, not so mad as he seemed, had been allowed the fullest liberty by the Indians, and his help proved of great value to the rescuers.

UNCAS, THE YOUNG MOHICAN, FALLS INTO THE HANDS OF THE HURONS

Speedily their plans were agreed upon. Heyward was to disguise himself as one of Montcalm's scouts, and boldly visit the Huron camp in the hope of rescuing Alice, while Uncas and Hawk-eye were to make for the camp of the Delawares and rescue Cora; the old colonel, under the guidance of Chingachgook, going to a place of safety along the stream.

The singing-master took Heyward, disguised as one of Montcalm's scouts, to the Huron camp, where he was received by a council of the Indians, and was parleying with them when Uncas was brought in as a prisoner. Magua,

arriving with his party of braves, was overjoyed to find his enemy at his mercy, and while some of the Hurons would have killed the young Mohican chief at once, Magua preferred keeping him alive to torture him later.

How the major discovered Hawk-eye inside a bear-skin

In the commotion which the capture of Uncas had caused, Heyward and his supposed mission from Montcalm were for the time being forgotten, and the stranger in the camp was only recalled to their minds when an aged chief came forward to ask if the white brother had skill in magic. To this the major, with a little hesitation, not knowing whither he might be led by his reply, answered that he had.

Saying that an evil spirit had entered into the wife of one of his young men, the Indian then led the way to a cave in the mountain-side, some little distance from the camp, where a young woman lay, evidently very ill.

"Now let the white brother show his power," said the old Indian to the major. "I go. Brother, the woman is the wife of one of my bravest young men; deal justly by her. Peace," he added, beckoning to a large tame bear that had followed them into the cave, rolling and grunting, to be quiet. "I go."

The old Indian then left the supposed worker of magic in the cave, and he had no sooner gone than the animal, which Heyward took to be one of the tame bears sometimes kept in Indian villages, rose on its hind legs, and lifting up its great, ungainly head, disclosed below the bronzed face of Hawk-eye, the scout!

The scout and the major outwit the Indians and rescue Alice

After his first moment of surprise, Heyward said to the scout: "Tell me the meaning of this masquerade. Why have you attempted so desperate an adventure?"

"The capture of Uncas is my reason for being here, and his own hot blood was the reason of his falling into the hands of the Hurons. By a stroke of luck I discovered an Indian conjurer, the owner of this bear-skin, who was preparing for the entertainment of the village in this guise, and speedily securing him, I made free with his finery, and am here to play his part, though not quite as he had intended. But let us hasten, for Alice is most likely hidden somewhere here," said Hawk-eye.

In an inner cave they were happy to discover the fair object of their search, and just at that moment Magua appeared at another entrance, only to be instantly disabled by the two white men, and bound and gagged. Quickly wrapping the girl in a blanket, Heyward took her in his arms, and, followed by the scout, who again imitated the walking of the bear, they appeared at the entrance of the outer cave, where were some of the relatives of the sick woman.

"Has my brother driven away the evil spirit?" demanded the old Indian. "What has he in his arms?"

"Thy child is better," returned Heyward gravely. "The disease has gone out of her; it is shut up in the rocks. I take the woman to a distance where I will strengthen her against any further attack. She shall be in the wigwam of her husband when the sun comes again."

The Hurons demand the return of prisoners from the Delawares

This speech satisfied the people, so, followed by the bear, Heyward, bearing Alice, passed boldly through the crowd and into the woods. When they had gone some distance, the scout urged Heyward to make with all haste for the camp of the Delawares and demand protection, as they were friendly Indians, but Hawk-eye would return to try to save young Uncas, in whose veins ran the last high blood of the Mohicans.

When the scout had reached the outskirts of the encampment again, he encountered Gamut, and disclosed his plans to him. Singing his loudest, Gamut led the way to the wigwam where Uncas was imprisoned, and told those who watched that he and the bear-conjurer were going to work a spell upon the captive. Believing that within the skin of the bear was the form of their own favourite magician, and that Gamut himself had supernatural power, the Indians made way for the two to enter. No time was lost now in making Uncas exchange places with Hawk-eye, while the scout changed his own clothes for those of the singing-master, whom they were to leave behind, knowing that the Indians would do him no harm. The ruse was successful, and thus Hawk-eye and Uncas escaped into the forest, eluding

the pursuit which the Hurons soon began when they discovered the deception that had been practised.

Major Heyward in the meanwhile had made such good haste that he arrived safely with Alice in the camp of the Delawares, and was granted protection; but when Hawk-eye and Uncas came later and asked for hospitality, they were placed under guard, though not unkindly treated.

Next morning Magua and a band of his followers appeared in the Delaware camp, dressed and painted as if for peace, to claim the return of their prisoners. A great council of the Indians was called, over which the oldest chief, named Tamenund, presided.

"Justice is the law of the Great Manitto," said the venerable chief, Tamenund, then over a hundred years old, in delivering judgment. "My children, give the strangers food. Then, Huron, take thy prisoners and depart."

UNCAS, THE LAST OF THE MOHICANS, FINDS HIS OWN PEOPLE

But the Indian who leapt forward to bind Uncas stood open-eyed with amazement, and pointed to the bosom of the captive, on which the figure of a small tortoise, tattoed in bright blue, was now seen, his breast-covering having become undone.

"Who art thou?" demanded Tamenund, strangely agitated.

"Uncas the son of Chingachgook," answered the captive proudly, "the son of Unamis, the Great Turtle."

"The hour of Tamenund is nigh!" exclaimed the aged chief. "Uncas, the son of Chingachgook, is found. Let the dying eagle gaze on the rising sun." And all who looked upon the young Indian knew him for the hereditary chief of the Turtle clan of the Delawares, among whom he now stood. Uncas was set before the people as their chief, and now Magua stepped forth and insisted on his right to Cora, the prisoner whom he had left to be guarded by the Delawares.

"It is the law," said Uncas. "Take your captive with you, and go. The sun is now among the branches of the hemlock-tree, and your path is short and open. When he is seen above the trees there will be braves on your trail." And surely, as Uncas said, the Delawares, under their new chief, went forth on the trail of the Hurons in accordance with Indian rules of war. The scout and Heyward headed another party of Indians, and, picking up Colonel Munro and Chingachgook on the way, were to attack the Hurons in the rear.

THE UNHAPPY FATE OF CORA, AND THE END OF A BRAVE YOUNG CHIEF

Desperate fighting took place at the Huron camp, and Magua and his braves, who still held out, were forced to find refuge in the rocky heights that overhung their camping-place. There they were pursued by the Delawares, and no mercy was shown. Uncas had marked down Magua for his own vengeance; but the crafty Huron had carried Cora with him, and Uncas could reach his enemy only by jumping from one perilous ledge of rock to another.

As he took the fatal leap, the Huron plunged his knife into the unfortunate Cora, and, with a wild shriek, Uncas stumbled and fell at the feet of Magua, who buried his tomahawk in the back of the brave young chief. With a shout of exultation, the Huron now sought to escape by leaping across a chasm, and all but succeeded, grasping the roots and grasses on the farther edge, and with his giant strength pulling himself up until it seemed as if he had won. But at that moment the rifle of the scout rang out, and the body of Magua fell whirling into the depths below.

Uncas and Cora were laid to rest with all the wild ritual of the tribe, and the old colonel, bowed with grief at the tragic fate of his daughter, was guided back to civilization by the scout, accompanied by Heyward and Alice.

As for Hawk-eye himself, white man though he was, he had lived too long in the wilderness to care for the ways of townsfolk, so he returned to be with Chingachgook and the Delawares.

THE MOHICANS MOURN THE DEATH OF THE LAST OF THEIR CHIEFTAINS

The joy of the old chief, Tamenund, had been short-lived, and his last words were: "My children, the pale-faces are masters of the earth, and the time of the red men has not yet come again. My day has been too long. In the morning I saw the sons of Unamis happy and strong; and yet, before the night has come, have I lived to see the last warrior of the wise race of the Mohicans."

THE NEXT PART IS ON PAGE 327.

THE FORTY THIEVES LEAVING THE MAGIC CAVE

Ali Baba, cutting wood in the forest, saw a band of forty thieves, and, hiding in a tree, saw the thieves enter the magic cave in which they hid their gold. Then the thieves came out again, and the cave closed up; but Ali Baba came down, called out "Open, Sesame!" as the thieves had done, and the doors swung open.

Ali Baba in the days of his prosperity

ALI BABA AND THE FORTY THIEVES

CONTINUED FROM P. 95

ALI BABA was a poor man who lived with his wife in a town in Persia, and one day he went into the forest to cut some firewood. He saw a band of forty thieves, and climbed into a tree and hid himself. The tree grew beside a great rock, and the forty thieves came to this rock and cried:

"Open, Sesame!"

A door opened leading into a cave, and the forty thieves went in and placed there the gold and silver they had stolen. Then they came out, and cried:

"Shut, Sesame!"

Then the cave closed up, and they rode away. Ali Baba then came down from the tree, and cried:

"Open, Sesame!"

Again the cave opened, and he entered, and found himself in a sort of treasure-house, stored with sacks of gold and silver; and, seeing that it had all been stolen, Ali Baba seized as many sacks as he could carry, and took them home.

"Now," he said to his wife, "I will soon grow as rich as my brother Cassim."

Another thought pleased him very much, for his brother was a proud and haughty man, who had married a very wealthy woman.

"We must measure how much gold we've got," said Ali Baba's wife joyfully.

So she went to Cassim's house and asked for the loan of a measure. Cassim's wife wondered what sort of grain her poor sister-in-law had got. So she put some wax under the measure, and when the measure was returned to her she found to her immense surprise, a piece of gold sticking to it. She at once told Cassim, and Cassim went to Ali Baba and asked him where he had got his gold from. Ali Baba frankly told his brother about the treasure-house in the rock, and told him how to open and shut the cave.

"I'll have all that gold carried away before Ali Baba gets a share of it," said Cassim to himself.

He at once took ten mules to the cave with the idea of loading them with all the sacks. He cried, "Open, Sesame!" and got into the cave, and danced with delight when he saw how much treasure there was. But at last he became so excited that when he wanted to take away the sacks he forgot the words that opened the cave.

"Open, barley!" he cried. "Open, wheat!"

While he was trying to think of the right word the forty thieves returned and found him in the cave, and killed him there.

The next day Ali Baba went to get some more gold, and he discovered in the cave the body of his brother, and carried it away and had it decently buried. Then, in accordance with Persian customs, he took his widowed sister-in-law to live with him; and with her came a clever female slave, whose name was Morgiana.

When the forty thieves found that the body of Cassim had been removed from the cave, they were full of fear.

"So there's another man who knows our secret!" said the captain. "But I know how to find him."

He disguised himself and went to the town, and inquired if a man who had been slain by the sword had recently been buried; and he at last learned that just such a man had been buried by Ali Baba.

"Now," said the captain of the thieves to his men, "I must arrange to get all of you quietly into the house of this Ali Baba; and you must come out at night and kill everybody there, and escape without being seen."

So he brought some of the huge leather jars in which the Persians used at that time to keep their oil, and he got a thief to get into each one of them, and covered them up, leaving a little space for air. He then put them all on some mules, and took with him one jar really filled with oil in case he should be called upon to show what he carried, and traveled at night from the forest into the town, and stopped before Ali Baba's house.

"I have brought my oil from a good distance," he said to Ali Baba, "and it is now too late to go to an inn. Will you kindly put me up for the night?"

Being a kind-hearted man, Ali Baba welcomed the captain of the forty thieves, and told the servants to look after the mules and bring in the jars. Morgiana was sent to cook a supper for the strange guest. Finding that she had no oil to fry the meat in, she went to take a little out of one of the jars. When she approached the thief thought she was the captain, and whispered:

"Is it time?"

"Not yet," said Morgiana.

She went from jar to jar, and found there was a thief in each, and at last she came to the jar which was filled with oil. She heated the oil in a great kettle, and then crept up to the jars and poured in the hot liquid, and scalded all the thieves to death.

"Now we'll see what will happen," said Morgiana.

At the dead of night the captain tried to arouse the thieves; but after peeping into the jars he saw that his men were all dead, and he rushed quickly out of the house. In the morning Morgiana told Ali Baba the whole story, and Ali Baba buried the dead thieves secretly the next night.

"But remember," said Morgiana, "there is one thief still at large; and you must be on your guard, for he will never rest until he has killed all of us who know his secret."

Morgiana was right. For the captain of the forty thieves soon returned in a new disguise, and set up as a shopkeeper, and tried to make friends with Ali Baba and get an opportunity of killing him. One day Ali Baba invited him to come to supper. Now, there is a very strange law of honour which all Persians and other Mohammedans strictly observe. Even the very worst man among them will not kill anybody with whom he has eaten salt. So the captain of the thieves said to Ali Baba:

"I should be pleased to sup with you, my friend, but I must confess I have a very curious taste. I can't bear the least bit of salt in any dish."

"Oh, that's easily arranged!" said Ali Baba. And he told Morgiana not to put any salt in the meat for supper; and that made Morgiana suspicious.

"So your new friend is a man who will not eat salt with you!" she said. "I must have a look at him."

She did so, and, in spite of the new disguise, she saw that he was the captain of the thieves. Moreover, she saw a dagger hidden in his dress. So she said to Ali Baba:

"Tell your strange friend that one of your slave girls will come and dance before him after supper."

When the supper was over she entered the room, attired in a beautiful dress, and began to dance the dagger dance. She whirled round and round in graceful movements, holding a dagger in her hand, and then rushed at Ali Baba and pretended to stab him. Then she lightly danced up to the captain of the forty thieves, but, instead of pretending to stab him, she drove the dagger into his heart.

"I recognized the villain!" she said.

Then she showed the dagger hidden in his dress. Ali Baba then married Morgiana to his eldest son, and gave her as a dowry a large share of the treasure in the cave of the forest.

THE QUEST OF THE GOLDEN FLEECE

ONE day, long, long ago, a centaur sat on the bank of a river, beside a stalwart youth, who leaned against the trunk of a shady tree. The centaur said:

"You are now twenty years old, and the time has come for you to reclaim the kingdom your step-uncle, Pelias, stole from your father.

"Oh, master Chiron," the young man replied, "I thank you for all that you have done for me. When I was a child you saved me from death by hiding me from my cruel uncle. Now I am a man, and I will do even as you bid me."

As he spoke, Chiron ran his eye proudly over the slim, steel-corded limbs of his pupil.

"You will succeed," he said to Jason. "Go and may the gods go with you."

Clad in a leopard's skin, with sandals tied with golden strings, and in each hand a spear, Jason set out.

Coming to the River Enipeus, he found the stream swollen from recent rains. There was no ferry and Jason sat on the shore to think of some means of getting across. Suddenly there appeared before him the goddess, Hera, in the form of an old woman.

"I will take you across," croaked she. "Get on my back."

Gladly Jason obeyed, and reached the opposite shore quite safely, except for the loss of one of his sandals. From the river's bank he hurried on to the town of Iolcus by the sea. The people in the streets, when they saw that he had lost one of his sandals, cried, "Look! Look! He wears but one sandal! He has come at last. What will the King say?" For, long before, it had been foretold that a stranger, wearing one sandal only, would come to Iolcus and would take the kingdom away from Pelias. When the King saw Jason he was much frightened. Then he thought he would entrap Jason by a question. "What would you do," he asked, "with a man by whom you were doomed to be ruined?" Jason thought. "I would send him for the Golden Fleece," he said at last. The Golden Fleece was the skin of a magical ram that had saved two children from death. It was hung upon a tree in a sacred grove in a land far away over the sea, protected by a fearful dragon. To secure the Golden Fleece would be the most difficult and dangerous task in the world.

Pelias was delighted at the suggestion, —for he thought that Jason would be killed, so he said, "You are the man. Go and bring back the Golden Fleece to me, and then I will give you my throne."

Again Jason thought. "I will go," he said fearlessly. "And when I come back you shall give me your crown."

Young Jason then went to a wonderful tree, known as the Talking Oak.

"What shall I do, that I may find the Golden Fleece?" he asked the oak.

"Go to Argus," said the tree, "and ask him to build a galley with fifty oars, needing fifty strong men to row it."

With the help of the goddesses Athene and Hera, Jason and Argus built a

ship which they called the Argo and invited fifty of the foremost heroes of Greece to join the adventure. When all was ready they set sail, and at length, after many adventures, the Argo came to Colchis, where the dragon guarded the Golden Fleece. Jason at once went to Aeetes, the king of Colchis, and told him of his errand. The king was very angry, but answered cunningly:

"Stranger, before allowing you to take the Golden Fleece, you will understand that I must first test your valor and your powers. You will find two brazen-footed bulls of mine in that pasture in the War-god's plain. The breath that comes from their mouths is flames of fire. If you will yoke these bulls and with them plough the field of Ares, and then sow the plain with dragon's teeth, then will I let you have the Golden Fleece."

It seemed an impossible task. Jason was convinced that he could not do it without some magic assistance,—and where in this strange land was he to get such help? But, unnoticed by him, while he had been in the king's reception hall, a beautiful girl had observed him. She was Medea, the daughter of King Aeetes, who at first sight loved the sun-browned, godlike stranger, and made up her mind to save him by her magic power.

While Jason was considering what he would do, Princess Medea came up to him and gave him a box of ointment. "Take this," she said, "and rub it on your body and your shield. It will protect you from the fiery breath of the bulls, and give you strength to overcome and tame them. Then when you have ploughed the field and sowed the dragon's teeth, throw a great stone among the warriors that will spring up from the ground. This will make them destroy each other instead of killing you."

The next day, Jason, with all the court of King Aeetes looking on, went into the plains to harness the fiery bulls. All happened just as Princess Medea had said. Jason overcame the bulls because of the great strength given him by the magic ointment, and was unharmed by the tongues of flame. But when the army of warriors sprang up from the dragon's teeth, it seemed to all the onlookers as if the young man would certainly be killed, for they all rushed upon him with drawn swords, shouting fiercely, "Guard the Golden Fleece." Remembering the words of the princess, Jason threw a great stone among the on-rushing soldiers, and immediately they all turned one upon another. Jason himself joined in the fray, and when at last the battle was over, he was the only man who was left alive.

The people marveled, and King Aeetes was so furious that he firmly made up his mind to kill Jason and all the heroes who had come to Colchis in the Argo. But the Princess Medea heard of her father's plan, and sent word to Jason, saying, "Meet me at midnight to-night and I will show you the way to the sacred grove where hangs the Golden Fleece." Accordingly in the stillness of the night Jason met her and together they sought the glory of the Golden Fleece. About the foot of the tree a fearful dragon lay coiled, its great neck swaying back and forth. Suddenly Princess Medea opened her lips and began to sing. With her eyes fixed upon the serpent, she slowly advanced singing — singing — all the while. In her hand she bore a spray of juniper dipped in one of her magic brews, and as the fumes reached the serpent's nostrils, its eyes began to blink and gradually closed. Presently the dragon-jaws closed and the fearful creature lay asleep.

"Hurry, hurry," Medea whispered to Jason. "Snatch the Golden Fleece and escape, for the dragon will soon awake." Fearlessly she smeared the head of the monster with her sleeping potion, while Jason seized the Golden Fleece. Just in time they fled together from the grove. With a horrible roar the dragon awoke, and seeing its treasure gone, pursued the two with fearful bellows. As they reached the shore, it was nearly upon them. But the Argo was ready. With one wild leap, they were on board, and the rowers quickly plied their oars and rowed away. As they drew from the land, the monster howled and spit fire from the bank, but it was of no avail. As the bright dawn streaked the west, the Argo set sail for Iolcus, bearing its treasure on board. Jason had won the Golden Fleece. With him went Medea, who became his wife.

THE NEXT STORIES ARE ON PAGE 355.

THE HISTORY OF ENGLAND

EVEN if we cannot travel in other lands, we can imagine with the aid of books what they are like, and in the same way, books tell us of bygone days in our own and other countries. Here we have a story, written by an Englishman for the children of his own land, of what the British Isles were like when his grand-parents were children; when there were only sailing ships at sea, and no railways on the land; no electric cars, no electric light, and gas was only just beginning. It would be strange to go back to those old times, and a man who had lived in the early part of the last century would not know the country if he could see it as it is now. But a thousand years ago, and even farther back, people lived in the islands. Who were they? How did they go there? What did they do? The story of these things is the history of England, which we are now beginning.

ENGLAND IN THE LONG AGO

CONTINUED FROM 124

THERE are some stories of which we never tire, and among them are those that we like to hear when we sit round the hearth, and the dancing firelight plays on the faces of those who are our home-makers.

"Tell us again what grandfather did when he was young, or just one story more about what great grandmother did when she was a little girl," is the eager cry. As the stories flow on—for father and mother love to tell as much as you love to hear—the life of the busy homeland of to-day, with the hum of its millions of workers, the clang and roar of its workshops and mills, all seem to be forgotten, as we step for a while into the quiet of the early part of last century.

You know the stories? How great grandmother, in a large beaver bonnet and silk pelisse, went, when a child, to Ramsgate in a stage-coach; how she slept at Canterbury, because the journey which you now do in two hours took two days. How she and great grandfather used to enjoy walking about the sweet green fields and woods, and resting in strawberry gardens near the Crystal Palace or Primose Hill, where now you see nothing but rows of houses and shops. How great grandfather took a whole week in a sailing-boat in rough weather to travel from London home to Berwick.

If you have a great grandmother who lived long ago near a large manufacturing town or port, such as Glasgow, Liverpool, Manchester, she can tell you stories of how rivers were deepened and widened, and docks built; how villages grew quickly to be large towns; how quiet country lanes became one wide stretch of factories and cinder-heaps, crossed and crossed by railway lines. These stories are as wonderful as those of the magic of the genii who made palaces appear at will.

We are so accustomed to all the comforts and conveniences in the life of to-day, with our well-paved, well-kept, and well-lighted streets, cheap and quick means of getting from place to place and sending messages, that perhaps we take them all as a matter of course. But it is not so long ago when there were no telephones, no motor cars, no elevators, no telegrams, no electric light, no bicycles, no railways, no penny post, no gas. As we listen to the stories of life without all these things, and how they all came to be, we realize how times change, and what a contrast there is between our wonderful world to-day and the yesterday which ushered it in.

And what about the times before

this yesterday? What happened in them? We can fancy the tide round our shores rising and falling day after day, year after year; the wind passing forever over the tree-tops, now gently, now roughly; the sun shining on and on, century after century, lighting up the waters of rivers and lakes and coloring the country-sides. But what about the people of the past? We know, in a way, that life has been going on in these British Isles for many years; most likely some great names belonging to them stand out for us. We realize, too, as we look about us or study pictures, that buildings such as Westminster Abbey, the great cathedrals, the Tower, and many now ruined castles and churches scattered all over the country were the work of the men of bygone days.

We can piece together the story of these days which are beyond the memory of living men by looking carefully at the work and relics that have come down to us from them, and by reading in books and letters the descriptions of the times in which their writers lived. Often these writers have copied into their books extracts from the writings of others who lived and wrote long before themselves.

WHAT WAS HAPPENING IN OUR HOMELAND 2,000 YEARS AGO?

By these means we can follow a written history of this country of ours back and back for nearly two thousand years; and it is by this written history that we know what happened through the centuries which we mark A. D. These letters stand for Anno Domini, the year of the Lord; we count our years, as they pass, from the date of the birth of Christ, over 1900 years ago.

The years before His birth we mark B. C., before Christ. Now, if you ask how many centuries there were before Christ, this is what no one can tell you. The great earth-ball on which we live has been journeying around the sun—once round makes one year; a hundred times round makes one hundred years, or a century—for thousands of centuries. No one can say how many, for no one knows when the earth first started on the yearly journey, nor when men first appeared on its surface.

Perhaps you may think the twenty centuries which hold our country's written history a long enough time to look across, filled as they are with stirring deeds and great changes. But if you wish to peer further back, and ask who were the very first men who lived in the country that is now ours, we must go back through ages of unknown length to seek them.

WHEN WILD MEN AND WILD ANIMALS WALKED FROM ENGLAND INTO FRANCE

Perhaps you have noticed how cliffs have been worn away by the sea, a few feet in a year, or you have heard of earthquakes in other parts of the world, raising or lowering whole districts; so you can understand that change is always going on in the shape of the land that rises above the sea. Now, the very oldest things found in this country are some roughly chipped stone tools, which dropped from the hands of the men who made and used them when this island home of ours was not an island, but was part of the continent now called Europe. Wild animals, as well as wild men, could therefore roam about as they pleased, with neither English Channel nor Irish Sea, as they are now called, to stop them. The white cliffs we see at Dover were joined to those at Calais, and the western parts of what are now the countries of France and Ireland showed an unbroken front to the great western ocean. You can judge of the size and strength of the wild animals who left their bones among us by visiting the Natural History Museum, where you can find those of the huge woolly mammoth elephants, of tigers—one of whom has left the mark of his sabre-tooth on the bones he gnawed—of bears, lions, reindeer.

THE FIRST TOOLS THAT THE FIRST WORKMEN USED

The poor, rough tools, shaped like a pear, found in the gravel beds or drift of old rivers, are ranged in numbers round the upper shelves in the Prehistoric Room in the British Museum. It is called prehistoric because the times to which they belong were before written history began. The owners of these tools looked out on a Thames stretching from the heights of Hampstead and Highgate to those of South London. What became of the Drift men, or the Cave men, who followed, we do not know. The Cave men's tools are better made and in greater variety; there are harpoons to catch fish, arrow-heads to shoot birds, and bone needles to sew skins together,

PUNCH AND JUDY IN THE STREET OF AN ENGLISH VILLAGE IN THE DAYS OF LONG AGO

ONE OF THE DIFFICULTIES OF TRAVELING BEFORE THE DAYS OF RAILWAYS

THE KIND OF SCHOOL GREAT GRANDMOTHER WENT TO. BY THOMAS WEBSTER, R.A.

When great grandmother was a girl there were no railway trains in England, and people traveled in coaches drawn by horses. It took some days to get from York to London, and traveling was slow and uncomfortable. The middle picture shows how difficult travel was in times of flood. The bottom picture shows us the kind of school great grandmother went to in the days when there were no fine schools such as now. The top picture shows the happy side of village life in great grandmother's early days, when Punch and Judy came round, and old and young people came out to see the show.

besides the sharp pear-shaped weapons for defence or for hunting.

The most interesting things the Cave men left behind are their drawings and carvings of the animals they saw before them; the great long-haired mammoth as he crashed along, the reindeer fighting, the oxen feeding, are all sketched from nature. Many specimens of these earliest drawings are found in the caves of England and France.

The earth-ball rolled steadily on through space year after year, century after century, and at last, as the ground sank in some places and rose in others, the sea rushed in over the lower levels and formed what is now called the North Sea, the English Channel, and the Irish Sea, and Father Thames shrank to a mere shadow of his former great size. After this men appeared again in this country from over the sea now that it was an island; many different tribes followed each other, the new-comers pushing the others northwards and westwards, even across to Ireland and to Scotland.

Necklaces that were worn in England thousands of years ago

As we look back to the far-off times of these settlers we find them very dark. They have left us no names, no writing. Perhaps the great stones set up at Stonehenge were used by them as a temple; perhaps they were set up about seventeen centuries before Christ. Seventeen centuries B.C. and twenty centuries A.D. makes thirty-seven centuries — 3,700 years—ago!

The long and round grave-mounds, called barrows, still to be seen in many parts of the country are also believed to belong to the peoples of these times. In them are found skeletons and burnt bones, together with the rougher cups and vessels you can see in the museum below the Drift and Cave men's tools. They are headed "Contents of British barrows." Sometimes a little child had a whole barrow to itself; sometimes many people are buried together. The ornaments, brooches, and necklaces found in them will interest us; also the tools of bronze found often in spots where they are supposed to have been made. In these early metal factories lumps of copper and tin, of which the bronze is made, often lie side by side with old tools to be remelted and made into new ones. Then there are iron tools which came into use as time went on and fresh people came to settle in various parts.

We get a few scattered beams of light on these times from the visits of some travelers, who came chiefly to look after the tin found in Cornwall and elsewhere.

The great light that began to shine on these times

When they reached home they did what many travelers do to-day: they wrote books about what they had seen. These were copied into other books, and in this way we hear of the barns in which corn was stored, the rich, sweet drink that the natives offered them, and so on. A few centuries later, in the first century B.C., a great light suddenly lit up the country in which we have been groping. By its help we can now see plainly the people who lived in it. They were the children's children of the tribes who settled there from time to time. We call them Britons, and their country is called Britain. Now, whence came the light?

Let us take our map and find the Mediterranean Sea—the sea between the lands of Europe and Africa. The nations who lived on the shores of this great sea were very different from the Britons and other tribes living in the islands set in the wild Atlantic. They traded with each other; some were very learned; some produced the most beautiful temples and sculpture, as well as the bravest men, the world has ever seen. They all believed, however, that the part of the world on which they lived round the great sea was the whole of the world. They did not know that the earth is a ball, on which are the great continents of the Old World, as well as those of North and South America in the New. As we have read in the STORY OF THE EARTH, on page 5, they imagined the earth to be flat, with a great river running round it, and extraordinary were the tales they told of the wild and savage people who lived on the "edge."

The great Roman soldiers who brought the light to England

These tales they generally made up; but sometimes, as we have seen, travelers went to see for themselves. Their tales were often wonderful, too!

Now, in the century just before the birth of Christ, one of these Mediterranean nations had succeeded in conquering all the others, so that it was master

THE COMING OF THE ROMANS INTO ENGLAND

THE LANDING OF THE ROMAN SOLDIERS ON THE COAST OF KENT 1900 YEARS AGO

A KENTISH HILL WHERE THE ANCIENT BRITONS MADE A LAST STAND AGAINST THE ROMANS

Julius Cæsar, a great soldier and statesman of Rome, invaded England 55 years before Jesus Christ was born. He did not conquer it, but visited it with his army and described it in books when he got back to Rome. A hundred years later the Romans sent an army to take England, and the Ancient Britons, after driving them back, at last yielded, in a battle fought on the hill shown in the bottom picture, at Hextable, in Kent, and, little by little, they gained ground, until they settled down and ruled in Britain. 300 years later, when the great power of Rome passed away, the Roman soldiers were called back, and Britons ruled their own land again.

of the whole of the then known world.

This was the Roman nation, and a great Roman soldier and ruler who stands out in this first century B.C. was the light-bearer.

As we study the calm, determined face of Julius Cæsar—his is the first bust in the gallery of Roman portraits in the British Museum — we shall find out by degrees what made him so strong and so powerful. He could make himself do what he believed to be best, as well as he could control others. He was always at work, conquering and settling his conquests, looking after his soldiers, and yet he found time to write books about his travels, which our schoolboys read now when they begin Latin. He gives many particulars about the Britons and their relations, the Gauls, whom he had just conquered. He did not conquer Britain; he visited it with his army two summers running, and described it to the civilized Roman world, who kept it in mind till a hundred years later. Then they were able to send enough soldiers to meet the warriors with faces stained blue to terrify them, to disperse the chariots with scythes on their axles, to take the hill-camps fortified with stakes and logs of wood, and in time to subdue all the country of the plains.

When Britons and Romans lived side by side

Little by little, as the soldiers, who had better arms and had been better trained, gained ground, many of the Britons were swept further and further west to the high moors of Cornwall, to the mountains of Wales and Cumberland. It is to these parts we turn, especially to Wales, to find the people whose forefathers were mainly Ancient Britons, and to find echoes of the language spoken by them. It was here, too, that the old religion of the Britons, with the white-robed Druids, lasted longest.

Scattered all over the country, but chiefly in Wales, we find place-names that come from British words meaning a wood, a rock, a plain, an island, a waterfall, and many others more or less connected with the soil. Numbers of the Britons settled down, as time went on, among their Roman masters, from whom they learnt many things. Some helped the soldiers to drain the marshes and cut down trees, and to make the fine roads which crossed the country, and are still a pleasure to use, so well and straight are they laid.

Boadicea, queen of England, and the brave chief Caractacus

Two great British names stand out in this first century A.D. Perhaps you know the statue of Boadicea, queen of one of the British tribes, which stands on the Embankment, by Westminster Bridge? She resisted the Romans, who had treated her very cruelly, with all her might, and our picture shows her well in her war car, urging on her soldiers to fight. Caractacus was another great British chief. He not only lost everything, in spite of his brave resistance, but was also taken prisoner to Rome with his wife and children. He did not behave at all as a frightened captive, but proudly, as a free-born king, said to the Roman emperor: "You fight to gain the whole world, and to make everybody your slaves. I fought to keep my own land, and for freedom."

For nearly four hundred years Britain was part of the Roman Empire. Great generals like Agricola came to push the conquests even further; he built a line of forts between the Forth and the Clyde to keep out the wild mountaineers of the north. Are you thinking of that deep, wide valley as it is to-day, with coal and iron mines, factories and ports, fine farms, and thousands of workers?

Emperors came and went; you can see their faces in the Roman Portrait Gallery in the British Museum, and may read their stories of where they stayed, and how they built walls to keep out the fierce Picts and Scots from Scotland and Ireland.

Memories of the time when the Romans ruled England

The remains of the wall between the Solway and the Tyne are still to be seen; a railway runs in that direction now, and the name is still before us when we speak of Wallsend coal, found at the end of the Roman "vallum." Other Roman names on our maps still show where the "cæstra," or camps, were raised to house the soldiers at Chester, Lancaster, Leicester. A "colony" was settled in Lincoln, and many places are called Street, from their position on or near the great "strata," or roads. Stratford is an example of this.

TWO BRAVE CHIEFS OF THE EARLY BRITONS

Boadicea was one of the first queens of the British people. She fought the Romans in the first century and led her people in battle, but she was defeated, and it is said that rather than be taken prisoner she slew herself. This statue of her stands at the foot of Westminster Bridge, facing the Houses of Parliament, in London, and on it are the fine lines "Regions Cæsar never knew, Thy posterity shall sway"; meaning that Boadicea's country should grow greater than Rome. This has come true, for Britain is now greater than Rome.

Caractacus was a great British chief living in the first century after Christ --about 1,800 years ago. He lost everything in fighting to drive out the Romans, and was taken prisoner to Rome with his wife and children. There he was brought before the Roman emperor, as shown above, but he was not afraid. "You fight to make everybody your slave," he told the emperor who ruled almost all the world; "but I fight for freedom."

The thousands of soldiers who came during these centuries from every part of the empire—the British lads were sent just as far away—left many remains on the soil of the country in which they worked so hard. Many of these remains are now in the great museums of the country, especially in the cities founded by the Romans—in London, York, Colchester, Winchester and Bath. There are the altars they set up to their gods; their weapons and armor; the tablets to show long and faithful service, which gave them their discharge from the army; the memorial stones put up to honor their memories.

Many treasures of money and jewelry, perhaps buried in a hurry when danger arose, and never reclaimed, have been found among the foundations of cities, along the line of the walls, and on the sites of the beautiful country villas. These were built in the sunniest and healthiest positions, generally with a fine view, amidst gardens with fountains and statues.

LIFE IN THE CITY THAT LIES BENEATH LONDON

We can well picture the life in these villas, as we look at the fine pavements, the shoes of the ladies and children, the lamps, writing materials, mirrors, and other treasures found buried amongst their ruins. Some of the pottery and glass were made in Britain, for the Britons were quick to learn, but most of the finest came through London.

London rose to be an important city in Roman times. Some twenty feet below the pavements of the City of to-day, so thronged with busy feet, we find the remains of its greatness. The strong walls built for its protection ran, to some extent, on the lines of the Underground Railway. Perhaps you have noticed how many stations on it have the word "gate" in their names—Aldgate, Moorgate, and so on, and from these gates in the walls started the great roads which passed over the country—something like the great main lines of railways at the present time—to connect the City with their stations at Lincoln, York, Chester, Bath, Chichester, and many others. Traders, therefore, found it a convenient spot to bring the goods they had for sale, especially as there was then, and for many years after, a short cut for their ships from the Channel by the streams that made the Isle of Thanet really an island.

PIRATES FROM OVER THE SEA CAME TO ENGLAND IN BOATLOADS

Some time, perhaps, in the third century, Romans, as well as Britons, began to give up worshipping the gods of their fathers, and listened to the preaching of Christian missionaries; so there presently arose British churches and bishops. The country improved in many ways—more grain was grown, trade increased, and it seemed as if Roman law and order, and the liking for fine and comfortable lives, had all come to stay.

But this was not to be. In Britain itself troubles thickened as the Picts and Scots became more and more daring, and pirates from over the sea landed on the east and south coasts. Year by year, as the spring came round, fresh boatloads landed on the most desirable spots they could find, and took by force whatever they needed. In other parts of the great empire troubles thickened too, as fierce tribes poured over its distant borders and made their way towards the beautiful and wonderful capital itself. The only thing to be done, as the empire grew weaker and weaker, was to give up the most distant provinces and recall the soldiers who held them to defend those nearer its mighty heart.

THE ROMANS LOST THEIR POWER & LEFT THE BRITONS TO RULE THEMSELVES

So they had to leave the walls they had built, the cities and camps, with the theatres and baths, the castles—such as those at Richborough and Reculvers, which guarded the way to London when "Thanet was full isled." There must have been many a sad good-bye, for often Romans had British wives and relations, and the departure of those who had helped to make the country so prosperous must have sown despair in the hearts of those left behind to cope with the difficulties and dangers as best they might. They had so long been taken care of that they had quite forgotten how to make plans for themselves and fight altogether.

Listen to a letter they sent to Rome, asking for soldiers to come back and help them; it is so sad that it is called "the groans of the Britons." "The barbarians drive us to the sea; the sea drives us back to the barbarians. We

ROMANS BUILDING A WALL ACROSS ENGLAND

THE ROMANS AT WORK ON THE WALL THAT KEPT THE PICTS AND SCOTS OUT OF ENGLAND

THE REMAINS OF THE ROMAN WALL ACROSS ENGLAND AS SEEN TO-DAY IN CUMBERLAND

The Romans, when they ruled in England, 1,800 years ago, built two great walls in England and Scotland to keep out the men who were always fighting with them, and the walls are still to be seen in parts of the North of England. The wall across the North of England stretched 70 miles, from the River Tyne to the River Solway; the wall in Scotland was smaller, reaching from the Firth of Clyde to the Firth of Forth.

are either slain or drowned." Many sad relics of this time are found in the caves, where whole families were forced to take refuge when their homes were destroyed by the pirates. Thus it was that the light shed over Britain by the presence of the civilized Romans went out as the last boats carried away the last soldiers across the Channel back to Italy.

The wild Picts and Scots burst over the now undefended wall, and ruthlessly burnt what they could not carry away back to the hills; the sea-rovers, who had been coming year after year to settle and stay, came ever thicker and faster.

They burnt the villas and towns, destroyed the camps, starved London to death because trade was stopped, and provisions could no longer come in by the land and water-gates from the roads and the river.

Once more Britons had to flee to the mountains in the west, and those who were left behind had to become the servants of the heathen new-comers, if they could not manage to stay on in their farms as owners.

We want to find out all we can about these new-comers, for it is they who are the forefathers of our race. Tremendous changes have taken place, for so many generations have been born, have lived and died, during the fifteen centuries that have elapsed since they were living on the earth. But still, as a nation, we keep up a family likeness, and in many ways take after our great-great-grandfathers. Many of us are as fair-haired and blue-eyed as they were; we love the sea and adventure, though in a quieter way, quite as much as they did.

Half the words in our language, including all the everyday words, have come from the language which the new-comers used when they first settled in this country, and in which they shouted directions to each other as they shipped their oars and grounded their boats on these shores.

Besides all this, and much more, the majority of our present laws, our ways of governing, our customs, have grown, through the centuries, from those they brought with them, together with the passionate love of freedom which we inherit from their old homes across the North Sea.

THE RUINED HOUSE OF A ROMAN GOVERNOR, HIDDEN UNDER A PLOUGHED FIELD IN KENT

Under the surface lie remains of Roman England. We see in the museums parts of beautiful floors taken from the ruins of houses in which the Romans lived in England nearly 2,000 years ago. This picture shows the ruins of a Roman governor's house buried in a field on the banks of the River Darenth, in Kent.

CONTINUED ON PAGE 341.

A sea-horse and the heads of two whales as imagined by artists of the long ago.

THE ZOO THAT NEVER WAS

ANIMALS OUR ANCESTORS BELIEVED IN

CONTINUED FROM PAGE 162

A CLEVER man has been writing about the intelligence of animals, saying that we give them credit for far more sense than they possess. How can we believe the horse to possess much sense, he wants to know, when, after the thousands of years that it has been domesticated, it still shies at a white stone on the road, or runs away and dashes itself to pieces at the sight and sound of a steam-engine or motor-car?

That seems very hard to answer. When we come to think it over, however, while we cannot but regret that some horses should still do these stupid things, we have to remember that the human race has not always been as wise as it is to-day. We remember that men have believed things which are quite as absurd. The horse is descended from a wild animal which learned that by a sudden rearing and swerving it could avoid the attack of enemies waiting to attack it, so to-day, when taken by surprize, it still shies on the road, because its instinct of fear and desire to avoid danger are not dead. Its instinct overmasters its higher reasoning powers.

And exactly the same thing happens in the case of men to-day. Up and down the country we find goats in stables. Why is that? It is because the grooms have a superstition that the goats keep disease away from the horses. Country people often believe that the nightjar robs goats of their milk, and call the bird the goat-sucker. Others believe that harmless little newts are endowed with a deadly poison, and think that frogs spit poison.

Savages, of course, have the most extraordinary beliefs. They *worship* everything that frightens or puzzles them. In parts of India they worship plague and cholera. One African tribe worshipped the bottles which had contained the medicine that cured them of illness. But the beliefs of savages are not more absurd then the beliefs which our ancestors held, even in days of learning. We can laugh at these beliefs now, but we can also get some instruction out of them. We must not forget that our ancestors believed in magic, and, believing in magic, nothing seemed impossible to their minds. They thought that the toad had a precious stone in its head, and that this stone could cure sickness. Hence so-called toad-stones became common.

Half the animals that never existed were supposed to have magic powers. Thus the unicorn, which figures in the national arms of England, was believed to possess magic in its horn. Men went on long pilgrimages in search of this animal,

which was said to roam in India, Arabia, and Morocco. No man arrayed as a man could approach it. He must disguise himself as a young girl, perfume his clothes, and lie down in the haunts of the unicorn. The unicorn, attracted by the scent, would then approach, and, charmed with the sweet

The unicorn as it was supposed to be

odor, would lay his head in the supposed maiden's lap, and fall asleep. Thereupon the hunter had to grasp the horn, and, with a single powerful wrench, pull it out! Or, if that were too bold a course for one man, then, the disguised hunter lured the unicorn to him, while others lay in hiding and dashed up to seize the coveted horn.

How men of the time managed to impose this story upon their hearers is not for us to decide. They were bold enough to tell the tale and actually to produce what they called the "horn of the unicorn." A writer of the time of Queen Elizabeth mentioned one which he saw at the queen's court. It was worth £10,000, he said, and in our time this would be about $250,000. What really was this unicorn's horn? It was the spiral horn, or tusk, of our old friend the narwhal! The rhinoceros was supposed to possess something of the qualities of the unicorn, and brave Marco Polo, the traveler, said that it did no harm with its horn, but with a fearful tongue, all covered with prickles, it rasped the flesh off its victim's bones!

How did men get their idea of winged dragons? There really were, once upon a time, creatures in some ways resembling the things which the frightened imaginations of men pictured. But they belonged to the age of great reptiles, and there were no men alive to know of them. The fact that these creatures had existed was not known to the world until long after men had ceased to believe in dragons. The real dragons did not breathe fire, nor had they for parents the eagle and the wolf, as our ancestors believed. There were no eagles or wolves when the real dragons walked the earth or flew in the upper air. All sorts of terrors were supposed to result from the dragons. As the unicorn and the rhinoceros were said to free the waters from the poison of the dragons, we have another reason why these animals were held in such respect.

But our ancestors did not waste all their fright over the dragons; they believed that the basilisk was a brute still more to be feared. This reptile, which was considered the king of its order, was supposed to be hatched by a serpent from the egg of a cockerel, and the cockerel was the only creature of which it was afraid. A glance of the basilisk's terrible eye was said to kill a man, while the creature was supposed to be so charged with poison that it infected the air, so that all living things,

An imaginary flying dragon

plants, herbs, beasts, and birds fell dead wherever it went. We can see for ourselves what this frightful monster really was, a lizard living upon little insects and small creatures frequenting the water and foliage in which it lived.

That gives us an idea of the power which our ancestors had of frightening themselves over innocent animals. They believed that there were creatures called satyrs, which had the head, horns,

legs, and feet of goats and the bodies of men. Then there were all manner of dreadful stories of hairy men with tails, which we know now were distorted accounts of the great apes. Every child to-day is familiar with the idea of the sphinx; but when we speak of the sphinx we think of that great image in the sands of Egypt. In the old days, however, the sphinx was a thing of real terror to man. They thought of it as an actual living creature—an animal with a human head and face, the body of a lion, the wings of a giant bird, and the tail of a dragon. But the griffin was still more to be feared. This was a creature which had the head and neck of an eagle, a hundred times enlarged, and the body of a lion, eight times as big as that of an ordinary lion. His talons were said to be as long as the horns of an ox, while his bones were so great that his ribs made bows for the stoutest warriors. No wonder, if this monster was believed in in Europe, that the Eastern peoples believed in the giant bird, the roc, which was said to fly away with characters in the well known "Arabian Nights." Then we must not forget the phœnix. This was a marvelous bird, sacred to the sun. It was as big as an eagle, with brilliant golden plumage round the neck, while the rest of the body was a purple color. The tail was composed of long and brilliantly colored feathers. Here, undoubtedly, we have the golden pheasant, which we may see any day at the Zoo. It is not as big as an eagle; it does not rise alive from its own dead body; it does not live 540 years—all of which was believed. But it otherwise answers the description which the old naturalists gave it. They *did* see a golden pheasant, then very rare in Europe, and had to weave a tale of marvel and magic and mystery round it.

The gorgon as our ancestors imagined it

An imaginary sea-bishop

They invented marvelous stories about the fox, the wolf, the hyena, the lion, and so forth. Men were supposed to be turned into wolves, and these "wolves" were supposed to be far more fierce than the ordinary beast of prey. Natives in India still believe that men are turned into tigers, and the natives of Australia imagine that they themselves are inhabited by the spirit of an animal, or a tree, or a plant. Much the same sort of ideas are to be found among the savages of Africa. The faith which our fathers in Europe held in the Middle Ages was much like that of the savage people of the world to-day.

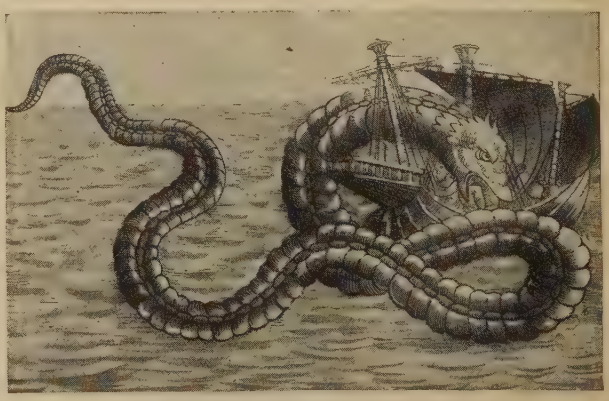
A dragon that many Chinese believe in

How firmly the old beliefs were held we may know from expressions used to-day. We still speak of a movement which has seen evil days, and comes again to prosperity, as "rising, phœnix-like, from its ashes." We still speak of persons who like the heat of the fire as "salamanders," because the salamander was believed to live upon fire. We still use the word "gorgon" as a term of terror and horror. The ancients had their gorgons, monsters whose heads were clad with serpents instead of hair. But our later ancestors had a gorgon of quite another kind. *Their* gorgon was a fearful creature living in Africa. It had the body of a giant armadillo, with a serpent-like tail, and the legs and feet of a pig, but it was all armed with great scales. The head was like an ox's, covered with coarse hair. But the eyes and the breath were the thing. Men were not quite sure which did the damage, one or the other sent forth poison which instantly killed men or animals who might attack or even approach the gorgon.

An old picture of sailors encamped on the back of a whale

Even a child can laugh to-day at the ridiculous things which frightened the wits out of our greatest scholars and philosophers of old time. We might not be so amused if our ancestors had merely believed in these things, as silly people in our own day believe in ghosts and witches; but they wrote solemn books describing terrible adventures with these imaginary creatures. The list of impossible things in which people believed in these ages is almost endless. There was a certain sort of lamb which grew on a tree. There was a tree which grew out of the sea from the timber of wrecked ships and produced geese. There was a frightful thing called the chimera, an awful creature with three heads — those of a lion, a goat, and a dragon. There were fabulous creatures called harpies and sirens which drew seamen to destruction. The harpy had a woman's face and body, but the talons of an eagle. The siren we know to-day is a terrible screeching thing used by motorists to wake sleepy drivers on the road, or by steamers at sea in a fog; but the sirens of old time were supposed to have lovely voices, which drew navigators from their course at sea, and lured them on to rocks.

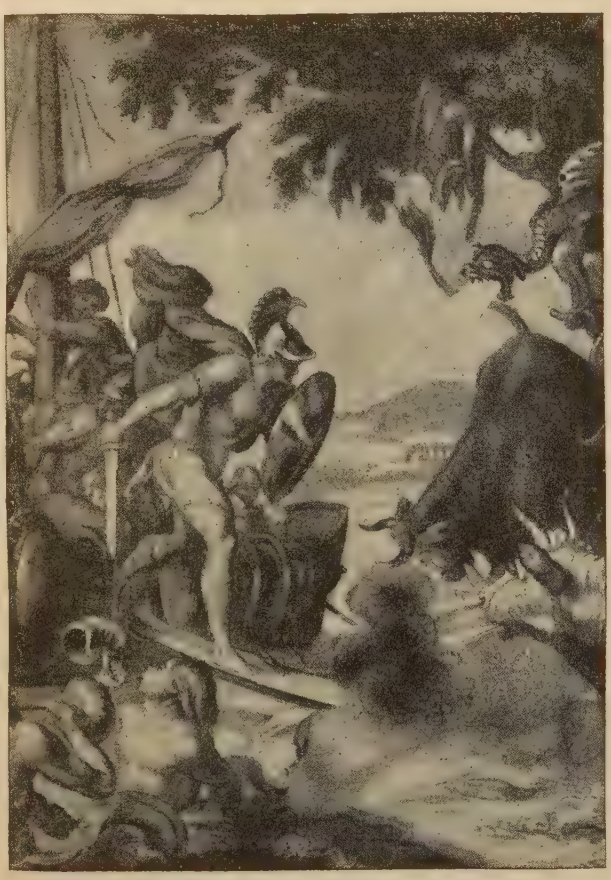
We need not be surprized that the sea gave our ancestors good scope for nightmare stories in which they could all believe. Even to this day, the vast, mysterious ocean has a fascination and terror. We all know the sea-lion, which is simply a big seal. But it used to be considered a monster of the deep like a real lion, clad in mail. The idea must have come from some observer noticing that this seal, when dry, shows a good mane, giving it rather a lion-like look.



An old picture of a sea-serpent attacking a ship

ST. GEORGE'S FIGHT WITH THE DRAGON

The fight of St. George is supposed to represent the triumph of Christianity over paganism. People once believed that a fight with a real dragon actually took place.



A fight with fire-breathing bulls and a dragon

Then somebody would argue from this description that the sea really had a lion, and would add the coat of mail as an ornament to his story. We have also the sea-elephant, a huge, funny-looking seal, with a snout something like a small elephant's trunk. Long ago men wrote about a sea-elephant, and drew pictures of it, making it appear that the animal had the head, trunk, tusks, and front legs of an elephant, the hind quarters being simply the body of a fish.

The size and strength of the whale should be enough to satisfy anybody, but it was not enough for our ancestors. They described it as being about 960 feet long and 480 feet broad. The teeth were said to be 12 feet in length, and the eyes were so big that twenty men could sit in the space of one!

The whale was said to have two horns, or tubes, through which it sent great columns of water that would sink any ship. Then the whale was declared to rise above the clouds and, descending upon the ship, sink it. Further, its head was armed with a great number of prickly horns. We can see here, through the exaggeration, that someone had tried to describe a toothed whale, but the idea of the horns about the head had arisen from the plates of baleen in the mouth of the whalebone whale This monster was said to come up to the surface of the water, bearing quantities of sand upon its back. Sailors would approach in their ships, and, mistaking it for an island, would cast anchor in its back, land, and make a fire on it to cook their meals, until the whale, feeling the heat, would dart down into the sea, carrying men and ship.

There remained the kraken to describe. Now, the kraken was the most terrible of sea-beasts. There were supposed to be sea-bishops and sea-monks who did all sorts of alarming things for the terrifying of unhappy mariners, but the kraken was the worst of all. It was a creature whose back measured a mile and a half in circumference, so that, as it floated on the crest of the waves, sailors mistook it, as they mistook the whale, for an island. But the kraken had arms like the tallest masts of ships, and with these it could seize the greatest vessel and pull it down beneath the waves. When the kraken sank, it was supposed to create such a whirlpool that all ships near were sucked under, and their crews drowned. It was a Norwegian bishop who first spread the story of this monster. There can be no doubt that he really did see a very large cuttle-fish. Nobody knows how big the

biggest of these really is, but we know that its body is nothing like what the frightened bishop thought he saw, nor are its arms capable of upsetting a ship. The stories of the kraken grew rapidly, but they became mixed up with stories of the sea-serpent, of which the most fanciful tales were told. There *may be* a sea-serpent, but, so far, no story has managed to stand unshaken. Ribbon-fishes have been mistaken for sea-serpents, a line of whales with peculiarly shaped backs has had the same effect, and many other curious sights have misled men into telling the same old story.

Then there were the mermaids and the mermen, and to-day many people believe still that these creatures actually exist. Poets have helped to keep the belief alive, and Matthew Arnold wrote a lovely poem on the subject. The mermaids were supposed to be beautiful women having the tail of a fish, and the mermen were the male members of the family. The mermaids and their lords and lovers are only manatees and dugongs, or sea-cows. All the mermaids of our poems and stories are lovely in feature, but the animals themselves are rather hideous, and dull, stupid things, too. They are about ten feet long, with curious fleshy muzzles ending in a sort of disc. The great virtue of the mother manatee or dugong is her love for her little one. She tends it with all the care and affection possible. When she feeds it, she raises herself in the water, clasps the little one to her, holding it with one flipper, while she swims with the other flipper. Thus, at a distance, a sailor might imagine the pair to be a mother and her child in the water. The legend as to the streaming hair could scarcely come from the bristles with which her head and face are surrounded. The manatees and dugongs live on seaweed, and no doubt, observers thought that this seaweed was mermaid's hair. One kind of merman was called a sea-bishop, because it was supposed to have a mitre-shaped head.

The list of absurd things in which our forefathers believed is not nearly exhausted, but those at which we have glanced help us to understand the strange world of thought and fancy in which they lived. We are not so far above our ancestors in some ways as we often imagine. Even now, in many a village, and in some big towns too, deep ignorance prevails.

THE NEXT PART IS ON PAGE 287.

Hercules slaying the many-headed hydra

THE STATUE OF CHAMPLAIN AT QUEBEC

In another part of our book we have told you something of Samuel de Champlain, the "Father of New France." This great man was born at Brouage, Saintonge, France, in 1567, founded Quebec in 1608, and died there in 1635. Few men have represented the finest qualities of their nation so well as he did. This spirited statue by Paul Chevré, unveiled in 1898, stands on Dufferin Terrace, near the Château Frontenac Hotel (also named for a great Frenchman), as you can see on page 1273. Both remind those who pass of the heroes of earlier days in Canada. Champlain was also a great explorer.

Photograph by Notman, Montreal.

WHAT THIS STORY TELLS US

A TRIP through Canada by one of the great lines of railway that now run across its width, can give only a small idea of the wonders of that country. To learn more of its beauty, we should have to take other trips; up the St. Lawrence and the Great Lakes; up the Saguenay and into the wild Ungava country; through the lake region that lies across the centre of Ontario; through the prairie sections of the west until the borders of the Arctic region are reached. In this one trip we have touched only a part of the wonderfully fertile, settled regions, and this alone has taught us enough to see some of the reasons for the great love that so many Canadians have for their country, and the deeply rooted belief that her children have in her future greatness.

CANADA THE WONDERLAND

"LAND of the mountain and the lake,
Land of the plain and river,
Our prayers shall rise for thy dear sake,
Forever and forever,"

chant the Canadian school children as they sing of their own land. Let us see how it deserves their praise.

We look at the map and see that, except for the peninsula of Alaska, it occupies all of the continent of North America that lies north of the United States. It is larger than the United States, and has great mountains and many lakes and rivers. So much the map tells us, but school is closed, the long, beautiful summer lies before us, and the rest we determine to see for ourselves.

We should like to follow the path by which Jacques Cartier entered the St. Lawrence, and sail in by the rocky island of Belle Isle, through the strait and past the shores of Quebec. But we are on this side of the Atlantic; our starting point is Boston, not St. Malo, and our course lies another way.

NOVA SCOTIA, THE LAND OF EVANGELINE

We want to see something of the Maritime Provinces, as the provinces which lie along the Atlantic are called, and we decide to go by boat to Nova Scotia. And now we are faced by a dilemma. If we land at Yarmouth, we shall be able to go through the Annapolis Valley with its great apple orchards, and along the shore of the Minas Basin. We shall see the country of Longfellow's Evangeline, the country of the Acadians, where many of the people live the same simple lives that their great-grandfathers did a hundred years ago, and oxen may be seen at work on the roads and in the fields. But, on the other hand, we want to sail up the great harbor of Halifax, and feel that we are arriving from some distant shore. The charms of Halifax win. Full of anticipation, we go on board a comfortable steamship, and sail across the arm of the sea, round the corner of Nova Scotia, up the rocky coast and into the harbor. Here we find a busy scene indeed. The harbor of Halifax is one of the finest in the world. The winter ice does not block it, as it does the St. Lawrence, and the government is building great docks, large enough for ocean liners to float in, and railway lines are being brought up to the wharves themselves, so that when passengers land, they may be whisked right away across the continent.

HALIFAX, THE GREAT CANADIAN PORT

The city is interesting, with its huge dry docks, large enough to hold a great dreadnought, its grim fortifications with their gray stone walls, and the houses of the city itself climbing

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up the hillside. It is a beautiful city, with an old world charm, and we spend a day here to see the Parliament Buildings, the lovely park and public garden, and Government House, which interests us greatly because in front of it the brave captain of the Chesapeake was buried.

We would like to go across to Newfoundland, the stern looking mountain island that guards the entrance to the St. Lawrence, but that lies out of our course and, as it is not part of the Dominion, we shall leave it for another time. Cape Breton Island, too, which lies towards Newfoundland, we must leave out, though it is part of Nova Scotia. Some other day, perhaps, we may come to see its mines and quarries, and the mines of the peninsula of Nova Scotia itself, as well as the little province of Prince Edward Island, where so many Highlanders settled, that at one time Gaelic was heard on every side. Now we are looking for the lakes and woods, and we turn our faces inland. Across the peninsula we go, and, leaving the land of the Acadians behind, we cross the great marsh of Tantramar at the head of the famous Bay of Fundy, of whose wonderful tides our school books tell.

But we are not thinking of school books, for we have crossed into New Brunswick, the land of the "forest primeval." We could spend a summer here, on the lakes and in the woods. Visions of camps in the forest, of long tramps through the woods to study their wild inhabitants, and visits to quaint farms or Indian villages rise up before us. We put them aside with regret, for we go the other way, and our train carries us northward, away from the beautiful city of St. John, with its strange Reversing Falls which we cannot stay to visit. St. John has a number of factories, a fine harbor, and docks large enough to hold the ocean steamships that make it their winter port.

Our way now lies northward through the province. On our way we cross the river Miramichi, and run along the borders of Chaleur Bay, and up through the mountainous country of Lower Quebec, as far as the St. Lawrence River. Then we turn westward along the shore of the great river until we reach the town of Levis.

THE BEAUTIFUL ST. LAWRENCE

Here we cross the river, and as we watch its waters hurrying by, we think of its never ceasing flow. From the chain of the Great Lakes, it comes, dropping from one into another, leaping Niagara, rushing through rapids, never stopping, never halting, until it reaches the sea hundreds of miles beyond us. Even in winter, when the river is locked in a sheet of ice, so thick that heavy loads may cross upon it without danger, and ocean liners are forced to seek another port, the water still flows on and on beneath its covering. But it is summer time. There is no hint of ice, and the air is full of the song of birds, and the gay songs of the inhabitants. For we are now in what was once greater France, but, following the capture of Quebec, was made a part of the British Empire. The people are of French descent, we hear French spoken all around us, and the people have lost none of their gayety by the change of rule.

QUEBEC THE HISTORIC

Quebec is the oldest city in Canada. It has many factories, and does a large amount of business. Most of the business is done in the Lower Town, on the river bank, and to reach our hotel, in the Upper Town on the table land above, we may take an elevator, or drive up one of the narrow winding streets, or we may walk up one of the steep stairways that climb the rugged cliff. The city has many fine churches, a large cathedral, and Laval University, a great Roman Catholic institution of learning and is full of interesting places that take us back to the historic times of its early days. We take a high old-fashioned carriage, called a caleche, and go to see the old walls, the Upper Town, and the Plains of Abraham where Wolfe and Montcalm fought and fell.

We take a slow train for Montreal, that we may see more of the country through which we pass. All day long we travel through the province of Quebec. Our train stops at many stations, and we hear the kindly greetings of the *habitants*, as the country people are called. They are a simple folk, and they live simple lives on their long, narrow farms, which stretch like ribbons to the river front, or in their old-time villages.

MONTREAL AND BEAUTIFUL MOUNT ROYAL

When we reach this city we go to one of the large hotels, and then go out to

WONDERFUL WORK OF THE WAVES

In the Bay of Fundy the tides rise higher than anywhere else in the world, and to these tides are due the fantastic forms of these rocks at Hopewell Cape, New Brunswick. The rocks themselves are of red sandstone and the forms are so curious that thousands have taken the drive of eight miles from Hillsboro to see them. Their size can be measured by the height of the man standing at the base of the larger one. In other places in our book we have shown similar effects of water. Some of the mountain pinnacles we see have been worn away by action of water through many years.

Photograph by Notman, Montreal.

see the city. It is the largest city in Canada, and perhaps the most beautiful, and is famous for its churches, of which the finest is the church of Notre Dame. McGill University is here, and a branch of Laval University, several other colleges, and an art gallery. There are two very fine hospitals and much manufacturing is done. But the glory of the city is its mountain park, which rises in its midst. In the early days, the town was built on the plain beneath Mount Royal. As the years went by, houses and streets were built until they reached its foot. Now the city stretches round its sides and the mountain itself has been turned into a delightful park.

At Montreal, we may take the Canadian Pacific Railway, and set out at once on the long journey of three days and three nights to the Pacific Coast. But we are not yet ready to leave for the West. There is much that we want to see in the rich province of Ontario, which lies across from us on the other side of the Ottawa River.

Through the Rideau Canal to Ottawa

Leaving Montreal behind us we set out for Kingston, the gray stone city on Lake Ontario where we gain our first view of the Great Lakes. We go to a hotel for the night; but we are so excited that we can scarcely sleep. We have decided upon a novel way of going to Ottawa, and have chartered a launch to take us up the Rideau Canal. In the morning our boat is ready. We go on board, and have the joy of going in leisurely fashion up the little waterway, now waiting while the water rushes into a lock to raise us to a higher level, now moving gently between thick woods, and again putting on more speed when the miniature canal leads us through sunlit fields.

Ottawa is the capital of the Dominion, where the Governor-General makes his home while he lives in Canada, and where the business of the government is carried on, in the way that you will find described on page 1451. The Parliament Buildings stand on a bluff looking down on the rushing waters of the Ottawa River. They were built in 1860, but the first buildings stood only until the winter of 1915, when they were almost completely destroyed by fire. The library building, with all the valuable books and documents which it contains, was saved, but of the main buildings only the walls were left standing, and these had to be torn down before rebuilding could commence.

The Lands of the Woods and Lakes

Ottawa is a centre of the lumber trade, for it is near the heart of the forests for which Ontario is so famous. The forests are silent now, save for the songs of birds, or the crash of wild animals through the bushes, for it is summer. In the autumn days, when the leaves turn red and gold, they are all aglow. But when winter comes, thousands of men arrive, and the peace of the woods is broken.

The men live in camps, and work all through the winter days, felling the trees and lopping off their branches. The sound of axe and saw, the songs and shouts of the men, and the noise of the log-piled sleds, turn the forest into a lively place. In the spring time, when the ice melts, the logs are floated down the river to the saw mills, and there they are cut up into lumber. We go to see the Experimental Farm and end our stay by a trip up the Rideau River to see the cataract from which it takes its name, and a visit to the Chaudiere Falls.

From Ottawa we may go across the country to take a peep at Algonquin Park, the Ontario national park, where birds and animals are carefully guarded. And now we may give ourselves the pleasure of camping for a few days on the edge of one of the lakes. It is a joy to get up in the early morning and stand on the rocky shore, breathing deeply the fresh pure air; to watch the stars fade out in the dawn, and the sky change from deep violet to clear blue. We spend some happy days bathing, fishing, swimming and canoeing, and when our last evening comes, we float on the lake in our canoes, and watch the sunset mirrored in the water. Gold and crimson and blue are reflected in the quiet lake, and we wonder, whether sky or water is more beautiful. The day is over, darkness falls, the stars come out, and the silver light of the moon appears, the cry of the loon is hushed. There is no sound but the little crash of the wavelets on the shore, and we go quietly back to land, to prepare for our early start for the Muskoka Lakes.

Here we have another lovely scene;

HOTEL DIEU, ONE OF THE OLDEST HOSPITALS IN THE NEW WORLD

This great hospital in Montreal was founded in 1644 by Mlle. Mance, with funds secured from France, and is therefore one of the oldest institutions of the kind in the New World. Montreal was only a tiny settlement when the institution began. The original site, on St. Paul Street, is now covered by business buildings. The hospital is under the care of the Hospitalieres de St. Joseph, who have always been devoted to good works. The present buildings on Pine Avenue, at the head of St. Famille Street, date from 1861. The institution has grown with the city and is now one of the sights which travelers wish to see. Many of the nuns do not leave the grounds. The slope of Mount Royal is seen behind and to the left of the picture.

Photograph by Notman, Montreal.

but it is different. There are steamboats and yachts, and launches as well as canoes going to and fro on the lakes. Hotels great and small, cottages and bungalows dot the wooded shores and islands. But beautiful as it is, we cannot stay long in this glorious playground. We must get back to the busy world again.

A LAND OF PEACE AND PLENTY

We should like to go through the country and see the prosperous looking farms, with their comfortable houses and buildings, and the cheese and butter factories, run on the co-operative plan, which send their products far and wide. We want to see the garden peninsula of Niagara, with its vineyards, its apple and peach orchards that in the spring time throw a veil of pink and white over the whole country-side, and its farmhouses, that in another country would be called villas. The cities call us with the hum of their busy factories, and we should like to see the silver and cobalt mines and the far famed Falls of Niagara; but we must leave them behind for we are on our way to the great West.

TORONTO, THE PROSPEROUS CITY ON LAKE ONTARIO

Another day has come, and we are at Toronto, our new starting-point. It is an important city, this capital of the most important province of the Dominion. We go for a long motor drive through its bustling streets, past warehouses and factories, through beautiful parks, by the buildings of the House of Assembly, and the Provincial University, out through pretty suburbs, their tree-bordered streets full of homelike houses, with well-kept lawns and gardens.

At the hotel we meet some friends who are spending their vacation on the lakes and we exchange notes of our experiences. They have come through the Gulf of St. Lawrence, and have traveled slowly up the river and Lake Ontario, stopping at every point of interest. They describe a trip up the Saguenay River, and tell us how its dark cold waters flow through a channel deep as an ocean bed, between rocky mountainous cliffs that look as if they had been standing since the foundation of the world. They went up the River Ottawa from Montreal to the capital, and are enthusiastic about a trip that they have taken by the old Indian route through the Trent Valley. There is now no need of portages, but the names of the rivers and lakes through which our friends have passed bring us back to pioneer days, and the days of the hunters and trappers. They went by motor boat up the River Trent to Rice Lake and then by steamer up the Ontonabee River through Clear Lake, Pigeon Lake, Sturgeon Lake and Balsam Lake, and through the canal to the sparkling blue waters of Lake Simcoe, which we saw from the train window on our way from Muskoka. They ask us to wait another day, before we start for the West, to go with them to-morrow to the neighboring city of Hamilton, the third manufacturing city in the Dominion, and we gladly agree.

HAMILTON, BEAUTIFUL IN SPITE OF ITS FACTORIES

In the morning we take the early boat, and a sail of a few hours across the Lake and up the land locked bay brings us to our destination. There are no buildings of great interest in Hamilton, but we find our way to the great fruit and vegetable market, for which it is famous. In the afternoon we take a motor car and drive about the streets. Hamilton has hundreds of factories, but they are not allowed by the home-loving people to destroy the beauty of the city, and everywhere there are lawns and gardens and trees. The city lies at the foot of a steep, wooded declivity up which we drive by a winding road and find ourselves at the top of the Niagara escarpment, which here takes a wide sweep and holds the city and the bay within a semicircle. It frames a scene of great beauty and we sit and gaze until evening begins to fall and the sun goes down in splendor, and then we make our way down to the station, and take the train for Toronto.

In the morning we take leave of our friends, who have planned to go up through the lakes, round Niagara Falls through the Welland Canal, into Lake Erie, through the St. Clair River into Lake Huron, through the ship canal at Sault Ste Marie into Lake Superior, and on up to the head of that great lake. It is the route by which the prairie provinces pour out much of their grain and it has fired the boys' imagination.

Again we are off, and now indeed we are on our way. We must go north again, to meet the main line of the Canadian Pacific, and then we turn westward. On

TWO FORCES FOR ENLIGHTENMENT

The Library of the University of Toronto stands surrounded by other University buildings in beautiful Queen's Park. The collection of books is excellent, and there are also several portraits of distinguished men connected with Canadian scholarship or achievement. The University of Toronto was once under the control of the Church of England, but is now non-sectarian. The attendance from many places is large.

Here is a view of a Toronto street, which though not the busiest in the city, is still important. The first building at the end is the old Post Office. Arrangements have been made to construct a magnificent new Post Office building which shall be in keeping with the constantly increasing importance of the growing city.

Photographs by Notman, Montreal.

and on we rush, through vast woods; then along the rocky shores of Lake Superior with its rich copper and nickel mines, through woods and by lakes again, and on through the wheatfields of Manitoba.

THE GOLDEN HARVEST FIELDS OF THE NORTHWEST

Those prairie wheatfields, how they capture our imagination! Away to the far horizon they stretch, miles and miles and miles of softly swelling ground, covered with a sea of green which ripples and waves in the sunlight. It seems to us to fill the whole round dome of heaven with a promise of food for the hungry, for we know that when we come this way again, the green will have turned to the gold of ripened grain.

Our grandparents can remember the time when it was believed that all this land was frozen ground, fit only to be the habitation of a few tribes of wandering Indians, the grazing ground of deer and bison, and the haunt of the fur-bearing animals. Now the deer and bison have disappeared, the Indians have been replaced by the white men, and the land has been turned into one of the granaries of the world. One feels sorry for the Indians whose places have been taken, but they have been gathered into reservations where they are cared for by the government, and efforts are being made to teach them and interest them in farming.

Just before we reach the wheat belt we stop at Winnipeg, a large, handsome city, which as late as 1870 was only a little hamlet almost unknown and quite overshadowed in importance by the trading post of the Hudson Bay Company close by. We wonder how it could have grown so great in such a little time. But as we walk about the streets we gain some idea of the romance of the great Northwest. For here we see many different types of people, and may hear the accents of many tongues. Here are not only people from the British Isles, and the older provinces of the Dominion, and from the United States across the border, but from many another country besides. Russians and Swedes, Finns and Norwegians and even Icelanders meet here to help build up the new nation, and the province has established an agricultural college to teach them the best way of farming. Winnipeg also has a university, and there are good schools here, as there are in all the towns and cities of this western region.

THE FERTILE LAND OF THE PLAINS

Leaving this cosmopolitan city, we are off again on our journey and now we go to the back of the train, and watch the line of shining rails as it stretches away in the distance, until it is lost in the sea of waving grain. It seems a slender thing, and yet it has been strong enough to conquer the plains. There was no great flowing river, or unbroken line of lakes to lure men to turn them into a land of plenty. Hudson Bay where the great explorer met his tragic death might have made a port of entrance; but that door is blocked by ice for more than half the year, and except by the fur ships only one attempt was made to use it. Only when the road of steel was built across the prairie did men come and see the promise that it made. Now all along the line, at every station, rise tall, tower-like elevators, to hold the millions of bushels of grain as it waits to be distributed to help to feed the world, and the plain is dotted here and there with the cosy dwellings of the homesteaders. Winnipeg is built where the Assiniboine flows into the Red River, and a short distance from the city the Red River runs into Lake Winnipeg. Thence the waters are carried by the Nelson River into Hudson Bay, for we are now north of the Height of Land and all the rivers of this region flow toward the northwest instead of toward the southwest. As we look at the map we are struck with the wisdom of the officials of the Hudson Bay Company who made Fort Garry, one of their principal posts. The Saskatchewan and the Saskatoon also flow into Lake Winnipeg, and down these rivers, and the streams which feed them, Indians and fur trappers, from the great territory which stretches westward to the Rocky Mountains, were able to bring their canoes heaped with rich furs, to fill the storehouses of the great Company.

We have passed through the province of Manitoba and part of Saskatchewan, and at length we leave the level land behind us, and the country begins to rise in grass-covered, flower-spangled slopes. All through the western part of Saskatchewan and in Alberta we find great cattle ranches, on which herds of cattle and horses have taken the place of the

TWO IMPORTANT BUILDINGS IN TORONTO

Osgoode Hall, the seat of the higher Courts of Ontario, was named for the first Chief Justice of Upper Canada, as the province of Ontario was once called. The dignified buildings stand on Queen Street, Toronto, and serve not only as the home of the courts, but as the seat of the Law School. The beautiful University Avenue extends from this point to Queen's Park, in which are the Parliament Buildings and the University of Toronto. We show some of the University buildings elsewhere.

Some of the strongest banking institutions in North America are in Canada. One of them, the head office of the Bank of Toronto, appears on the right of this picture, which shows King Street looking east. The tall building in the distance is the new Canadian Pacific Railway office building.
Photographs by Pringle and Booth, Toronto.

bison. There are sheep ranches, too, and beautiful farms, and towns and cities are springing up along the lines of railway that are being built in every direction. Regina is the chief city of Saskatchewan, but Saskatoon, about a hundred and fifty miles northward, is also an important city, and it is here that the agricultural college and the experimental farm are situated, and also the University of Saskatchewan, of which we read elsewhere. Regina was a prairie spot in 1885; Calgary, in Alberta, is only two years older, and already these two cities are prosperous centres of industry with fine public buildings and comfortable houses. There are forests in Alberta, and the province also has large coal mines which supply a great deal of coal to these western provinces.

Edmonton, the capital of Alberta, which twenty-five years ago was but a little village, now has about 70,000 people living in it. At Bassano, in this province, we find the greatest dam which has yet been built in the world. It stores up the water of the Bow River for irrigation purposes. There are universities in both Edmonton and Calgary.

The Land of the Mountains

And now we have reached the Rocky Mountains, the great rampart that, until the line of railway was built, kept British Columbia apart from the rest of Canada. For a hundred miles or more, we have been catching glimpses of snow-covered peaks, like fingers pointing skyward. Now we have passed their outposts, and we know that nothing we have seen, or heard or read has prepared us for their grandeur. From one great scene to another we pass, each seeming to be more beautiful than the last, until we are silent from very wonder. On and on we go, now climbing a steep grade through dark forests, now rushing beside a foaming river, through a flower-decked valley, or rounding curves where we seem to hang on the brink of precipices, creeping across awful chasms, zig-zagging up the sides of one giant mountain, boring through the heart of another in a spiral tunnel, to come out again a mile above the entrance. Up and up we climb, and we ask where men who dared the task of constructing such a road, were found.

For hours and hours we pass through the solitudes before we reach the downward slope, and the great engines that pull our heavy train seem like children's playthings before the awful majesty of the mountains. For a thousand miles they stretch, up towards the Arctic wastes, and when at length we reach the British Columbia valleys, we have come through four hundred miles of mountain peaks, with lakes and waterfalls and rivers, whose beauty no one can describe.

There are coal mines in these mountains, and gold and silver and copper. At Banff, where we stopped for the night at a hotel such as we might find in New York, or Montreal or Toronto, there are national parks into which the province of Prince Edward Island might fit comfortably twice, and here bison, elk and deer, with all the smaller animals, roam at will. Wild sheep and goats will not come near the railway, but if we could have gone some miles into the valleys we might have caught a glimpse of these graceful animals on their feeding-grounds among the rocks.

And now we have left the snow-capped mountains behind us, and are in a land of forest-covered hills, where the Douglas fir often towers three hundred feet, and of park-like valleys where thousands of sheep and cattle feed, and as we go on towards Vancouver, we again run through farms and orchards.

British Columbia is a beautiful country. Norway has not such lovely fiords, nor Switzerland such a sea of mountain tops. It has great industries too — fisheries and mines and lumber — and Vancouver, which we have just reached, is the centre of them all.

The Gateway of the West

Again we have left the country behind us, and are again in the bustle of a large city with tall buildings, great hotels and busy streets, and a beautiful park at the water-side — Stanley Park, of which the city is justly proud. Across the bay lies the mountainous island of Vancouver, and there we shall come to another city, Victoria, the capital of the province.

We have reached the western gateway of this wide Dominion, and as we look back over our long journey from the Atlantic to the Pacific, we understand why the children proudly chant of its mountains, its lakes, its plains and its rivers.

THE NEXT STORY OF CANADA IS ON PAGE 553.

THE GREAT NATURAL WEALTH OF CANADA

HOW TIMBER LOGS FLOAT HUNDREDS OF MILES FROM THE FORESTS TO THE MILLS

A SHEEP RANCH ON THE GREAT PRAIRIES OF WESTERN CANADA

LOADING SALMON IN BRITISH COLUMBIA, FROM WHERE MILLIONS OF CANS OF SALMON GO

Canada is rich in minerals, in forests of timber, in land for herds of cattle and flocks of sheep and crops of all sorts; and her rivers teem with fish. These three scenes show something of Canada's wealth. At the top are logs from the forests, which may have floated many miles along the rivers to the saw-mills. Next we have a view of a sheep farm which a few years ago was a wild prairie. The third picture shows us a picture of the salmon-fishing industry. The waters of British Columbia are the home of so many fish that she can spare many hundred thousand cases of salmon, containing millions of cans every year.

BANFF, WHERE THOUSANDS SEEK HEALTH AND PLEASURE

This is one of the great hotels that add so much to the comfort of travel along the great railway lines in western Canada. Banff lies within reach of a number of beautiful places in the Rocky Mountains, and a large number of travelers break their outward journey here, and, from the hotel as a centre, make many excursions.

Stanley Park, Vancouver, is one of the chief attractions of that growing city. It is situated on the end of the peninsula on which the principal part of the city lies, and contains nearly a thousand acres. Some of the finest trees in North America grow here, and this group is called "The Cathedral," from the similarity of their great, towering trunks to the stone columns that support the roof of a great church.

Picture by courtesy of the Canadian Pacific Railway.

A WORLD OF SALT BELOW THE GROUND

This is the famous salt-mine at Slanicu, in Roumania, one of the largest in the world. Nearly 80,000 tons are taken from it every year, and it is estimated that if 100,000 tons were taken yearly the mine would last for another 200 years. The mine is a great world of salt 340 feet below the surface of the ground.

The entrance to the Slanicu salt-mine is by an inclined plane, up and down which run the trucks conveying the salt from the mine to the surface of the ground. Hundreds of men are employed all the year in this mine, and its floor of salt is lowered every year by about six and a half feet.

This is a dried-up sea in the Colorado desert, California. Indian laborers have washed the salt and stacked it in heaps ready for transport to the refinery. The salt deposits extend for many miles.

THE SALT OF THE EARTH

CONTINUED FROM 194

SCATTERED every here and there throughout the great universe there are two elements, called sodium and chlorine, which are very fond of each other. Sodium is a curious, soft metal which can be cut with a knife, and is very difficult to keep pure; chlorine is a colored gas which causes certain death to any kind of living creature if breathed in any quantity. But when sodium and chlorine unite, one atom of each with one of the other, they make a compound called sodium chloride, or common salt; and this is the salt of the earth.

It is the most abundant salt in sea-water, and no number of figures could suffice to give us any idea of the amount of salt there must be dissolved in the sea. It is also very common upon the earth in places where salt water has been in days gone by. Even in our rivers and streams, a certain quantity of this salt will be found; but that is not all, for salt plays a part in the body of every living creature.

When there is a very great deal of salt in any place, it interferes with life, and that is why salt is used to preserve things from the action of germs which would make them go bad. Salt is invaluable for this purpose in the preservation of food, like meat and herrings. But when the proportion of salt is less, it serves the purposes of life. All life is lived in water, but we may go a step farther and say that all life is lived in salt water. So we must all have salt in our food, and indeed it is one of the foods without which no one can live. Our blood is rich in salt.

Salt and other compounds of sodium are to be found everywhere, and wherever salt or any compound of sodium exists and is made hot, it gives forth a special yellow light.

By passing any light through a prism, we can clearly detect the bright yellow lines that mark the presence of salt, or, rather, the sodium in the salt. It is only natural, then, to turn our attention to the light that reaches us from the sun and the stars, and no sooner do we do so than we find that the stuff which is in our bodies, which fills the sea, and even forms a sort of rock upon the earth, is abundant in the sun and in many of the stars. We cannot be surprised at this, for the substance called salt is necessary to life, and is found in all living creatures.

A great deal of salt is taken from the water of the sea, or of salt lakes. In some places the salt deposit is found on the surface of the earth, as in the Great Basin. Sometimes it is dug from mines; but although there are some famous salt mines, they supply us with only a small proportion of our salt. Often the deposits are so deep down in the crust of the earth, that it is easier to pump the salt up in the form of brine, either from natural springs of water which have passed over salt deposits far below, or by pumping fresh water into a well and bringing it up again after it has become saturated with the salt it has dissolved. Salt wells are sunk with two pipes, one inside the other. Compressed air is forced down one pipe under pressure, or, if the well is dry, water is pumped down and as the water or air reaches the bottom, the brine is forced up the other pipe.

How salt is made fit for use

In most cases, then, salt comes to us in the form of brine, that is, it is mixed with water, which must be evaporated. The simplest way of doing this is by the heat of the sun, or solar evaporation. Water from the sea or a salt lake is led into a series of shallow pools, where it evaporates, leaving the salt behind. The salt is then raked into heaps, and as soon as it is dry, it is ready for market. This method of making salt has been known since man first discovered the crystals on the edge of a rocky pool and it is still in use in many places. Much salt is made in this way in some of the countries of Europe and Asia and in some parts of the United States, and large quantities of salt are gathered from lagoons on the southern shore of the Caribbean Sea. This, of course, is the cheapest way of making salt. But the salt so made is never free from impurities, and while satisfactory for some purposes, we do not care to use it in food.

An improvement in salt making came when some one thought of evaporating the water by boiling it. This method is called the pan drying process, and consists in boiling the brine in large shallow pans, built over furnaces. As the water is evaporated by the heat of the fire, the salt sinks and is raked out on to draining boards in front. Most of it is then carted away to storehouses to dry, but the salt intended for use in food is put through a special process to make it pure and fine enough.

This simple process has been improved by an invention by the use of which hot air from a closed in furnace is carried along under the pans, and as the heat under the pans near the furnace is greater than under those farther away, salt of different degrees of fineness can be made, and grinding is not necessary.

On this continent, however, the methods known as the grainer and vacuum processes are those chiefly used in large salt blocks, the name by which salt making establishments are usually called. In the grainer process brine is pumped from the wells into cisterns, from which it flows into large tanks called settlers, which are provided with steam pipes to heat the brine. In the settlers it loses such things as gypsum and iron, and then, if coarse salt is to be made, it goes on to the grainers, shallow vats or tanks, with steam pipes running through them. As the salt falls to the bottom of the grainers it is scooped out to drain, and is then carried away to dry.

The vacuum process for making fine salt

The vacuum process is a late invention for the making of very fine salt in what are called vacuum pans. The vacuum pans are tall tanks from which the air is drawn, and in which copper steam pipes are fixed. Brine from the settlers is brought into these pans, which are kept by the steam in the pipes at a temperature of about 150° Fahrenheit. This is not a very high temperature, but it has been found that in a vacuum brine boils violently, and forms very fine crystals at this point. As the salt crystals drop to the bottom of the pan they are drawn off to be dried. In some places the salt is taken at once to a rotary kiln or drier, which has steam pipes down its centre, and is laid at a slight slant. As the kiln slowly rotates, the salt slips down its length, drying as it goes, and when it reaches the lower end, it is ready to be passed through screens into bags.

In a newer method, the salt drops from the vacuum into a rapidly revolving drum, called a "centrifugal," because in this, nearly all the moisture is flung out by a centrifugal force before the salt reaches the kiln.

THE NEXT STORY OF FAMILIAR THINGS IS ON PAGE 303.

THOUSANDS OF TONS OF TABLE SALT

The snowy salt that fills our salt-cellars may have been dug out of the earth, or it may have been pumped from the earth in the shape of brine. This picture shows the wonderful Russian salt-field of Solinen, and, stretching away far into the background, we can see the vast tanks full of salt water, or brine.

After a certain time the water in the tanks evaporates, and leaves the salt glittering on the ground in the form of crystals. The salt-crystals are then collected into heaps by women, as we see here, and these heaps are afterwards built into great white stacks containing hundreds of tons, like those in the top picture.

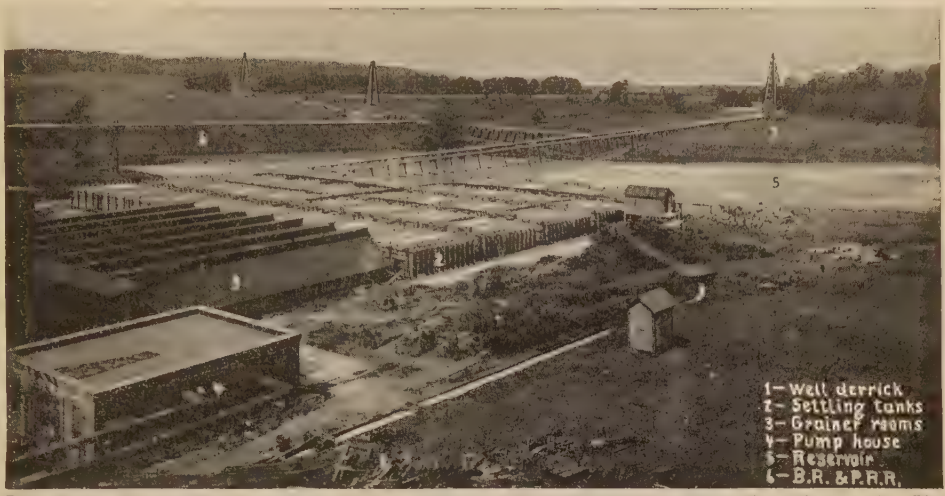
Photographs copyright by Underwood & Underwood, N. Y.

COLLECTING THE SALT FROM THE BRINE

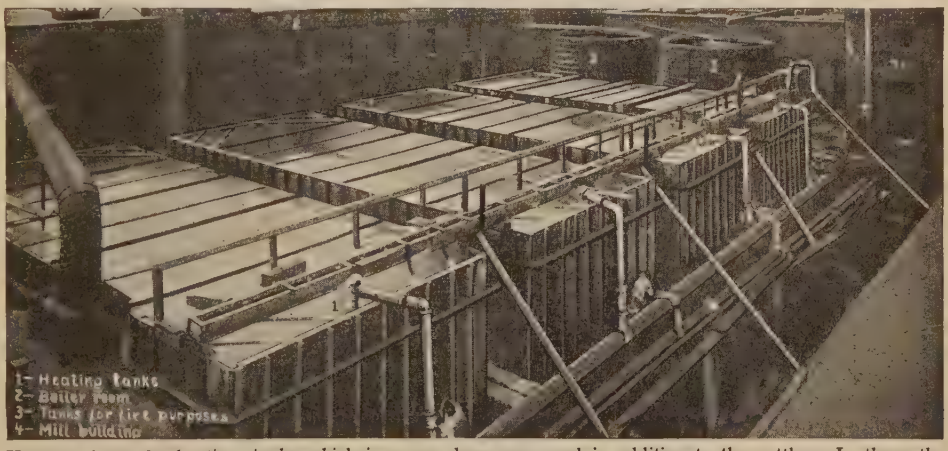
Sometimes, instead of waiting till the whole of the water has evaporated and left great masses of salt in the reservoirs, as shown on page 239, the crystals are raked out of the brine as soon as they begin to form. In some salt districts evaporation is assisted by artificial heat, the brine being boiled in huge pans.

As the salt forms round the edge of the reservoir it is raked into little heaps. This salt is then removed, and to make fine table salt it is placed in moulds, the water drained off, and the salt dried by artificial heat. For a salt of a larger grain the brine is left untouched for a longer period, and the evaporation is slower.

HOW SALT IS MADE FROM WELLS



This picture gives us the beginning of the process of making salt from brine drawn from deep wells. The low buildings, marked 2 in the centre of the picture, are the settlers of which we read on page 238.

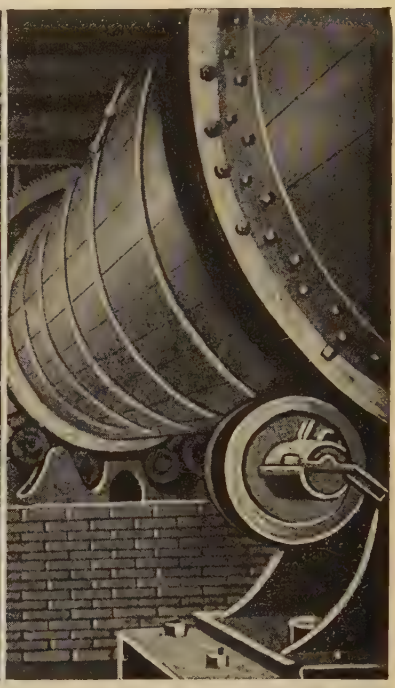


Here we have the heating tanks which in some places are used in addition to the settlers. In these the brine is heated, and heavy impurities, such as gypsum and iron, which would hurt the salt, are removed.

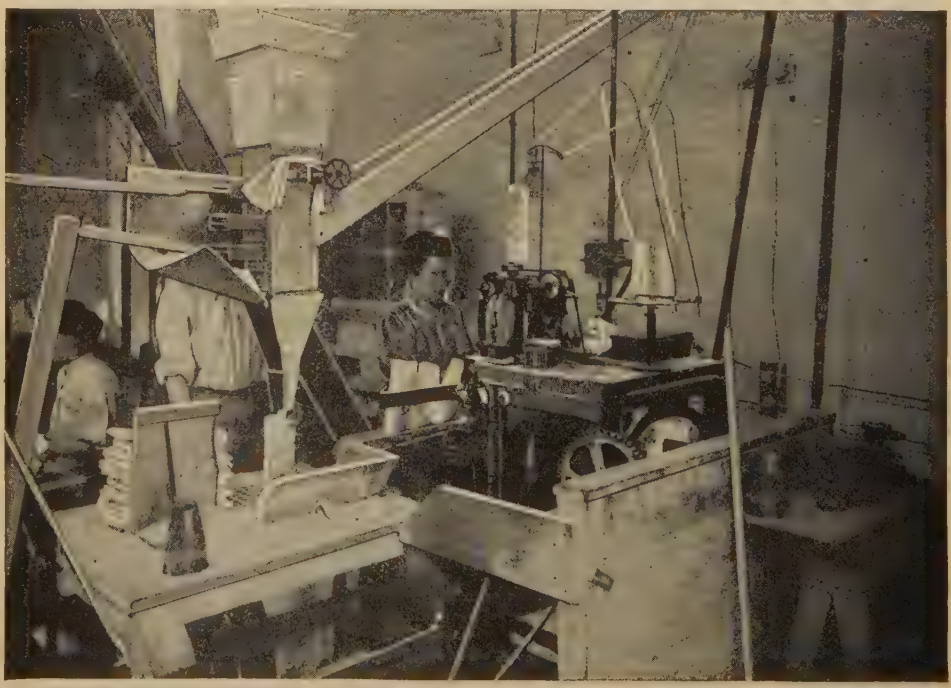
In the next part of the process, the hot brine is allowed to flow into grainers—shallow tanks in which it is heated by steam until it reaches a temperature high enough to crystallize the salt.

MACHINERY THAT MAKES FINE TABLE SALT

This is the top of a vacuum pan, in which brine is boiled very rapidly to make salt with fine crystals. The pan is a tall cylinder about 50 feet high and 9 feet in diameter.



Each vacuum pan can produce daily over 100,000 pounds of salt, which is drawn into this slowly revolving pipe or kiln to dry.



The kiln shown in the picture above rotates slowly, and as it is set at a slant the salt slips down through it. When the end of the pipe is reached, the dry salt drops down through the little chutes, shown here, into bags held ready for it. The bags are then neatly stitched up, and the salt is all ready for market.

WHAT THIS STORY TELLS US

WE learn more and more here of the wonderful way in which plants help to keep the world alive, and as we read we shall come to understand the great mystery of the stuff that makes the grass green. Without this we could not be alive. We know that all air contains carbonic acid gas, which is poison to us and to all animals. But the plant has a secret which no man knows of; it can split up this gas and live on it, taking it into its own body and building up food for us to live upon. To do this the plant uses the greatest power in the world, the power of sunlight. The leaves of a plant are flat and thin, so that they can drink in as much sunlight as possible, and the power of the sun helps the green stuff to split up the carbonic acid gas into two parts. One of these the plant eats itself, and the other it gives back to the air quite pure. If it were not for the plant's power of doing this there would be no life anywhere, and the world would be as dead as a stone.

A PLANT'S WONDERFUL SECRET

CONTINUED FROM 188

LET us now see what we mean when we say that a plant breathes. If we can understand this for a plant, we shall understand it for every living thing, including you and me. When we talk about breathing, we usually think of the way in which our chests move up and down, as we draw the air into our lungs when we are taking a breath, and then let it out again.

Now, a plant has no chest or lungs, and many animals have neither chest nor lungs, but yet they all breathe. It is not necessary that a living thing shall move up and down, or in any other way, to enable it to breathe. We do so; but that is because we breathe so very quickly, and because we have learnt a special way of breathing that is very easy and successful. But all breathing is really one and the same, whether it is done by a plant or an oak-tree, or a fish or a man.

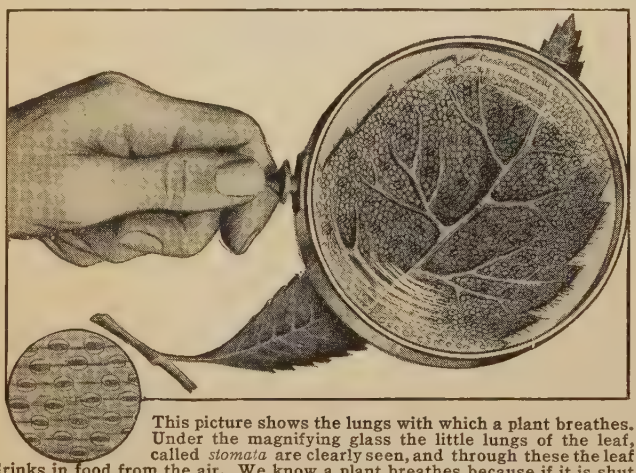
Wherever living things are to be found, whether under the water or out of the water, there must always be a particular kind of stuff called oxygen. This is a thing we may have never seen or heard of, and yet, whenever we see anything at all, we see through oxygen—because it is part, and the most important part, of what we call air. Oxygen is found in air, and it is also found in water. If a living thing lives in air, it has to get its oxygen from the air. If it lives in water, it has to get its oxygen from the water. The first plants did this because they lived in water, like many plants of to-day, and like crabs and fishes and many other animals. But later plants, like the flowering plants, moved out of the water on to the land, just as animals have done, and so they have to get their oxygen from the air, just as cats and horses and birds and men do.

Breathing is an act that has two parts, which go on backwards and forwards always; and the first of these two parts is taking in oxygen. Every living thing does this, and must die if it ceases to do it. But what is the second half of this act of breathing? You may well ask. Directly we think about it we shall see that the oxygen which is taken in by breathing must go somewhere, something must happen to it, and the simple fact is that the second half of the process of breathing always consists of giving back the oxygen to the air or to the water.

But if that were all, of course there would be no sense in it; it would not be worth doing. But the point is, that whilst the oxygen comes in

alone, "by itself," it always comes out again with something else; and it is that which makes all the difference. This something else, though you could hardly believe it, is the same stuff as that which makes coal and diamonds and the writing part of lead pencils, and its name is carbon.

When this carbon which the oxygen has found in the body of the animal or the plant is joined to the oxygen, it is turned into something which would look like oxygen itself if you could see it; but you cannot see it, however closely you look at anyone when he is breathing. It mixes with the air, and though you cannot see it, you see through it, just as you see through oxygen itself. This new kind of stuff, like oxygen, and like the stuff which comes through pipes into houses, and is burned at the end of them, is a kind of *gas*, and the special name for it is carbon dioxide. Every living thing, from its first moment of life to its death, breathes in oxygen and breathes out this stuff which is made of carbon and oxygen, and which is called carbon dioxide.



This picture shows the lungs with which a plant breathes. Under the magnifying glass the little lungs of the leaf, called *stomata* are clearly seen, and through these the leaf drinks in food from the air. We know a plant breathes because if it is shut up from air it dies of suffocation. The little circle shows the lungs larger.

Now, plants must do this because they are living things, and they cannot live without it. But this breathing is not one of the things that a plant is very good at doing. Indeed, a plant breathes just as little as it can in order to keep itself alive. It is quite easy to prove that a plant must breathe to some extent, at any rate, because you can suffocate a plant as easily and certainly as you can suffocate an animal. If you keep away all oxygen from an animal, you suffocate it, and it will die, and the same is true of a plant. If it does not have enough oxygen, and have it all the time, day and night, any living thing, from a microbe up to a man, will die of suffocation.

Just because this is true of every living thing, we must not forget it in the case of the plant; but at the same time a plant needs far less oxygen than an animal, because it breathes much more slowly, and the curious thing, as we must now see, is that most plants are specially good at doing something which is just the opposite of breathing, something which no animal can do, and which every animal depends upon plants to do for it. The plants that do this wonderful thing that we are going to talk about are all green plants, or, at any rate, if they are not green, like grass, they are brown, like seaweed. But the little difference in color does not matter, for the stuff that makes the seaweed brown is really the same as the stuff that makes grass green. This stuff is so important that we must think of all plants in the world as divided into two great kinds—those which have this green or brown stuff, and those which have not. The first kind we shall call green plants, and we must now talk about them very carefully.

Very nearly all plants are green plants, but we have already mentioned one or two that are not—such, for instance, as the mushroom. You never found a green mushroom or a green toadstool. The plants that have no green stuff in them are peculiar, so to speak. We must think of them as if they did not do what a plant ought to do; they have lost what is the most striking and important power of plants, and so for the present we can leave them out of account.

The green stuff of all other plants is really one and the same everywhere—even when it is brown, as in some seaweeds. It is the same stuff in a cabbage, a blade of grass, a leaf of a tree, or the scum of plants that forms on a still pool

of water. It has a long special name, but here, I think, we need not bother ourselves with that; we may just call it green stuff.

This green stuff is most important because of what it enables the plant to do, and that is what we must now talk about. But we must begin at the beginning—and that beginning is not the green stuff itself, but the sun, the great and glorious sun. By itself the green stuff can do nothing; it is of no use to the plant, and is only a burden to it. Indeed, if plants are cut off from sunlight altogether, they die at once, or, at any rate, lose all the green stuff in them. It is the sun that makes the green stuff in the plant, and the green stuff's only use, after it is made, is to help the plant to profit by the sun.

These pictures show how a plant needs light. The first shows a plant withering in the dark; the second a plant thriving in the sunlight. The leaves of a plant are flat so that they can drink in as much sunlight as possible, and the power of the sun helps the green stuff to split up the carbon dioxide into two parts. One of these the plant eats itself, and the other it gives back to the air quite pure.

Now, this is just a tremendous fact, and we should make a very great mistake if we went on to talk about what the green stuff does without making quite sure that we understood what the sun does. Without the sun there would be no life at all upon the earth. Just as all living things depend upon each other, and just as they could not exist unless they were always serving each other, as we saw a little while ago, so the whole company of living things depends upon the sun.

Company is a very good word, because its real meaning, as you will learn again some day, is "the people who feed together." *Com* means with, or together, and *pany* really means bread. Your *companion* is really the little boy who *eats bread with you.* Now, all living things do their feeding with each other, with each other's help, and so we are very right in calling them a company; but without the sun none of them could feed at all, and they would all die. Indeed, it is really the light and power of the sun that we all feed upon, and the wonderful thing about the green stuff of the green plant is that, without the green stuff, we could not use the sun light. First of all, the sun makes the green stuff in the green plant, and then uses it to feed the green plant and all other living things, including you and me, for we get all our food either from the green plants or else from the bodies of animals that live on green plants.

Without the sun there would be no life upon the earth; or, to put it very shortly and plainly, in a way that I think

you ought to remember, *No Light, No Life*. I do not think it has ever been put much more shortly than that, and yet, short as that is—no light, no life—it is absolutely true, and there are no exceptions to it anywhere, and never have been, and never will be.

IF THE SUN WERE TO GO OUT EVERYTHING IN THE WORLD WOULD DIE

The green stuff, then, though no life can do without it, is only an instrument, something the light uses to make life. If the sun were to go out—though there is no fear of that—all the green stuff in the world would not help us at all, and all the plants and animals would soon die. There was some excuse, you see, for the ignorant and untaught men of long ago who used to worship the sun. When we go out on a bright day and enjoy the light and warmth of the sun, we must remember that if it were not for this light and warmth we should not be here. This is true of us; it is true even of animals that live in the dark; it is true even of trees and fishes, and seaweed and microbes. Some of these creatures, like microbes, may be killed by sunlight, and they have to keep out of its way; so may we be killed by sunlight if it is too strong, and gives us sunstroke. But even microbes depend upon the sun for their life, for without the sun none of the things upon which microbes feed could possibly exist.

Now that we have learnt how important the sun is, we are ready to look at the green stuff of the green plant with a new interest, since it is the means by which light can produce life.

THE REASON WHY A LEAF IS FLAT AND THIN

You will remember that we have already spoken of the tiny specks of green stuff which give the leaf its color. Now, this green stuff is to be found in other parts of plants besides the leaves. We know that the stem, or stalk, of a rose is green. But most of the green stuff of plants is found in their leaves, and it is for the sake of the green stuff that leaves exist at all. The leaves of a plant are its tools for using the green stuff. Directly we think of a leaf we see that it is made in a particular way. It is a flat, thin thing. So much are leaves flat, thin things that we call other things which are flat and thin "leaves," though they are not parts of a plant at all—the leaves of this book, for instance. The first books were made of real leaves.

Now, there is a very good reason why leaves should be flat and thin. Leaves exist in order to expose as much green stuff as possible to the light. If a leaf were shaped like a ball, only the green stuff on the outside of it, and, indeed, only the green stuff on the side of it which was turned to the sun, could receive the sunlight. All the rest would be in darkness, and that is as good as to say that it would be quite useless. If you like, you may try to think of some kind of leaf that would expose its green matter to the sun in a better way than the leaves you know. But you will not succeed. Perhaps you never asked yourself before why a leaf is shaped like a leaf; but the question is worth asking, and the answer is that no other shape can be even thought of that would be so useful.

WHAT THE SUNLIGHT DOES WITH THE GREEN STUFF

The object of a leaf is to expose as much green stuff as possible to as much sunlight as possible, and it does this perfectly. Of course, a leaf must have two sides, and if one side is exposed to the sun, the other must be in the shade. But, then, leaves are usually so very thin that the sunlight can go right through, and so none of the green stuff is wasted.

Sometimes, when leaves have to be rather thicker, you will find that as little green stuff as possible is wasted, for now almost all the green stuff is packed on to the upper side of the leaf, which is dark green; and if you turn it over you will find that the under side is hardly green at all. Green stuff is of no use where it cannot get the sunlight. But you see how well things fit in with each other, for the green stuff is made by the sunlight in the first place; it is made where the sunlight strikes the leaf, and is made just where it can be useful.

And now we come to something rather more difficult; but it is not too difficult for us, and it is very important, for it is necessary to all life. We have agreed that there is something which the green stuff does by means of the sunlight, or, better still, there is something which the sunlight does by means of the green stuff. Now, what is it?

THE NEXT PART BEGINS ON PAGE 283.

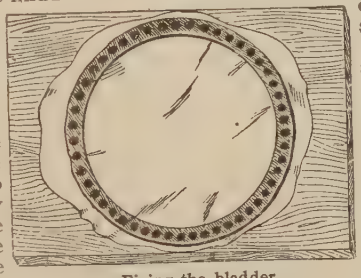
AN EASY WAY TO MAKE A TELEPHONE

CONTINUED FROM 112

TO make a real telephone is a somewhat difficult task, but we can make a good telephone which will enable us to speak, in favorable conditions, up to a quarter of a mile away with very simple materials.

The materials we shall require include two boards about 14 inches long, 10 inches wide, and about half an inch thick. We should be able to get such boards by breaking up an empty box, and sawing up two of the boards to these sizes. Then we cut a circular hole about 8 inches across in the middle of each board. We have first to mark the holes to be cut out.

This is easily done by getting a plate about 8 inches across, laying it face downwards in the middle of the board, and marking the wood round the edge of the plate with a lead-pencil. To cut out the holes properly we should have a keyhole saw or a fret-saw; but if we do not have either of these tools we can make shift by making holes with a gimlet right round the circle we have made. The holes should be as close together as we can get them. Then by using our chisel we can cut out the circular hole. Having done this, the boards are ready, and we can put them aside until we have the other parts of our telephone ready.



1. Fixing the bladder

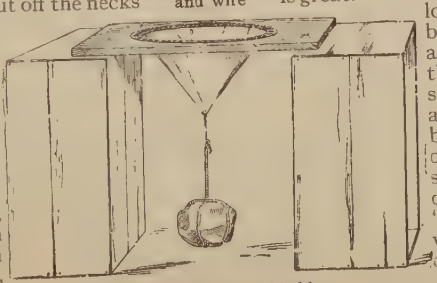
Now we want two fresh beef-bladders. We blow them up hard, tie the necks with string, and put them aside for a few days to stretch. We must not leave them so long that they get dry, however. When they have stretched, we cut off the necks and soak the bladders in warm water until they are white and pliable. Then we put them over the holes in the boards we have prepared, putting the outside of the bladders to the wood. They should be put on evenly without creases, and not stretched in one direction more than in another direction.

2. Button and wire

Now we take a thin leather band, or some pieces of leather which we can make into a thin leather band, and tack it all round one of the holes above the bladder as seen in picture 1. This will attach the bladder securely to the board. The tacks should have big heads, and should be driven well home. Old boot-tongues will do nicely for the leather. We cut these up into strips about half an inch wide for the purpose. We fix the two bladders in this way to the two boards in which we have cut the holes. Then the edges of the bladder outside the leather strips should be cut away.

Now take a button and attach a thin wire to it by passing the wire through two of the holes in the button, as seen in picture 2, twisting it so that it will not come out. Make a hole right in the middle of the bladder and put this wire through. Then hang something heavy—a weight of about 7 pounds, or a large stone—to the other end of the wire, as seen in picture 3, putting the board in some position so that the weight can pull down the bladder. We treat both bladders in this way, and leave them in the sun until the bladders are dry and hard.

All that remains to be done now is to fix up the two boards and bladders at a distance apart, and connect them by fixing a wire to the two wires attached to the buttons. This wire should be fine copper or tinned iron wire. The wire may need to be supported if the distance is great. This can be done by hanging loops of string to the branches of trees, or to any posts that may be in the way. Then we may speak from either end, and the words should be heard distinctly at the other end. We should speak close to the bladder. When we wish to "ring up" the other end, we tap the bladder at our end with a pencil.



3. Stretching the bladder

HOW TO MAKE A DAINTY BRUSH AND COMB BAG

EVERY girl should wish to make her surroundings as charming as possible; and it is easy, by giving a little time and thought, to turn an ugly room into quite a dainty place. A pretty bureau is such an important feature in a bedroom that we are going to learn how to make a dainty addition to it in the form of a brush and comb bag.

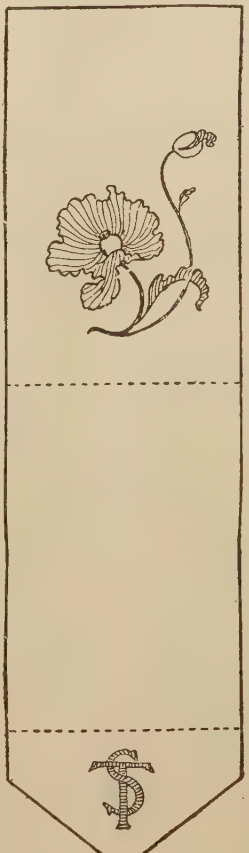
Of course, there are many kinds of such bags, and many ways of making them. You can make something quite pretty and useful from a piece of white linen at the cost of a few cents; but to-day we are going to see how to make one for "very best." It will be more elaborate, and will take a little longer to make; but everybody will agree that there is much greater pleasure in using something that we have made our selves than something that has been bought at a shop.

The bag we are going to make is really quite simple, and should not cost more than a dollar.

The first thing to do is to get a strip of soft white satin about 30 inches long and 8 inches wide. Tack the edges neatly with white cotton, so that they do not fray while you are working. On one end draw a pretty bunch of flowers about 3 inches from the top and about 6 inches in length. You might draw a pretty spray of poppies, with leaves, or dog roses, with foliage. If you cannot draw, you can buy a pattern, which you can transfer to the satin.

Pin your pattern carefully in position, taking care that the bright side of the design (which is slightly raised, as you can feel by passing your finger over it) is touching the satin. Then press the paper on to the satin with a hot iron. It must not be too hot, or it will scorch the satin, or too cold, or it will not bring the pattern off. Then quickly remove the pins and lift the paper, and you will find the pattern transferred on to the satin.

If you have chosen a poppy design work it in the pink shades of the Shirley poppy which are so lovely. Use embroidery floss, and work the flowers in pink, and the leaves and stalks, of course, in green. If you do not want to put a great deal of work into it, you can make an outline of the flowers and foliage; but the effect will be much prettier if you work the pattern all over.



The pattern for the bag.

The bag finished.

You must be very careful not to make the stitches too tight, or you will draw, or pucker, the satin. When this is finished, draw your monogram, or your initials twined together to form a pattern, on the other end of the satin, about 1½ inches from the bottom. Embroider the monogram, or your initials (if you cannot draw, you can buy initials), in pink and green, or perhaps in pink only if you prefer it.

Now undo the tackings, and cut the end near the monogram either round or pointed, as you prefer.

Then take a strip of pale pink silk to match the embroidery silk, and of exactly the same size and shape as your strip of satin, and lay them together, taking care that the embroidery is inside. Tack the silk and satin together all round except at the straight end—that is, the edge where the flowers are worked, and stitch it down neatly either by hand or by machine.

If you use a machine, you must take care that it does not pucker. This can be avoided by sewing strips of paper in with your work, which can afterwards be pulled out.

Now turn your work inside out, when you will find your flowers on the right side. Sew the silk and satin at the straight end neatly over and over.

Take the embroidery, and double it over 12 inches from the end, when the sides will come together. Sew these carefully over and over, and you will find that you have a pocket with a straight piece, which must be turned over to form a flap. Then take some medium-sized pink cord to match your lining, and sew it over and over round the bag and flap, taking care to make loops of the cord at all the corners, and fastening it off neatly at a corner.

Turn down the flap and in the centre work a buttonhole. Put a pretty, fancy button underneath the buttonhole and on the bag itself. And now you will find that you have completed a very pretty and dainty addition to your toilet-table.

You could, of course, make it all in white, doing the embroidery with white floss, using white lining and cord to correspond, then the effect will be altogether charming.

A LITTLE GARDEN MONTH BY MONTH

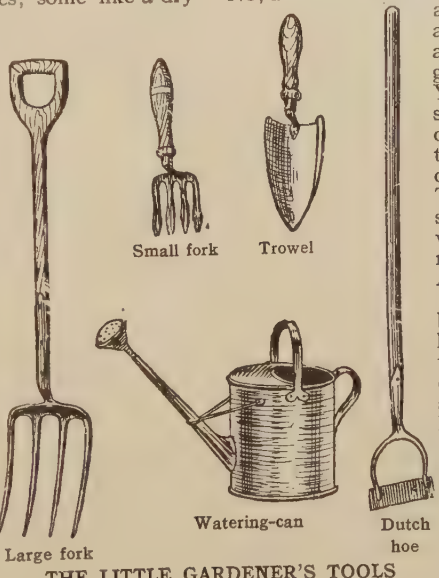
WHAT TO DO IN THE MIDDLE OF APRIL

THE spring is a capital time in which to start a little garden of our own—the earlier the better, but the middle of April will do if we have not thought of it before.

Gardening is a splendid hobby, because it gives us plenty to do and plenty to think about, and plenty of wonderfully interesting things to find out. When we make a garden and plant it, we set ourselves the task—and it is a very pleasant one—of looking after the welfare and health and comfort of all sorts of plants, many of which have different tastes and requirements; and it is one of the experiments we must always be making to see if we are giving each plant just what it most wants. Some like a great deal of sunshine, some like the shady places; some like a dry position, some a moist one; some like to grow among the stones, some stretch up, and need arches or posts to support them.

After we have acquired our plot of ground, we need a supply of tools before we can transform it into a beautiful garden; and we ought to get tools as large as we can comfortably handle. This applies especially to such an important tool as the spade. Other tools that will be needed will be a hoe; and many people find what is called a "Dutch" hoe the most convenient to use for weeding.

A rake will be necessary to smooth the surface and to clear up the rubbish. Something smaller than the spade will be needed for planting, and for this purpose a trowel is useful; but where it is a question of digging holes in ground where many bulbs may lie hidden, a trowel may damage them, so that a little four-pronged fork in a handle of the same length as that of the trowel is very useful; and, if we cannot have both, the little fork will do all that the trowel does, and should be the one we should choose.



THE LITTLE GARDENER'S TOOLS

A large fork set in a handle the same length as the spade is a most useful tool, and can often be used for digging, especially round about plants already established, as it is not so likely to injure their roots as the spade. A watering-can is necessary, and one the rose of which takes off and on should be bought, as quite as often we need to water through the spout as to sprinkle the water through the rose. A wheelbarrow is useful to have, either to bring soil or to cart away weeds, leaves, and other rubbish; or, failing that, a strong basket will take its place.

The first work in the garden plot will be to dig it as deeply as you possibly can—that is one of the reasons why it is necessary to have a spade that really can do some good work, because deep digging is of the utmost importance. You can understand that the deeper you work the soil the better it is for the roots of your plants, and in well-worked soil these go creeping out in all directions to find food and drink wherewith to build up and sustain healthy and sturdy leaves and stems and flowers.

The middle of April is not too late to sow seeds of many plants that will flower during the summer and autumn. Plants that flower so quickly as this are called *annuals*. They do not come up year after year in the garden, as some plants do, and live for many seasons. No; annuals are the shortest lived of all plants, and you must sow seeds afresh each year. But an annual accomplishes a great deal in its little life. You sow the seed; the seedling appears, grows quickly into a little plant; the buds appear, and open out into beautiful flowers. Then they fade, and the seed-vessels grow; and when the seed has fully ripened the plant dies. And all within the year!

Among the prettiest and brightest of annuals are larkspurs, poppies, nasturtiums, scarlet linums, and dwarf convolvulus. The sweetest smelling is, perhaps, the mignonette, and one that is interesting for its quaint seed-vessels is known as love-in-a-mist.

The great point to remember in seed sowing is to sow as *thinly* as possible, and however thinly we sow we shall have to draw out many of the seedling plants when they appear, but we can think about that later on; though any boy or girl who already has a garden, and has reared his seedlings, may at once set about thinning them, as it cannot well be done too soon.

Some of the seeds may be sown in lines, especially where we need a row to serve as an edging; or, again, they may be sown in circles. These, when they grow up, make nice patches. There are a few rules always to be borne in mind when sowing seeds in the open ground. The soil must not be so wet that it is sticky and hangs together in lumps, neither should it be so dry that it is like powder. Secondly, the seed must not be buried too deeply; and thirdly, as already mentioned, it must be sown thinly.

If the soil is too wet, we must wait for a few days until wind and sun have partially dried it, and if it is too dry it must be watered. It will be in splendid condition if it has a good

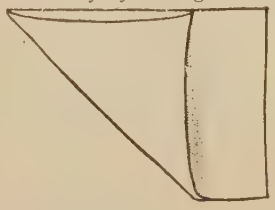
watering the day before the seed is sown, where it has become dry and parched, as often it is on the surface during April. It is very interesting to have an especial flower for each month, and there is no doubt that *the* flower of April is the daffodil. There are many sorts of daffodils, or narcissi, as they are often called in catalogues. They need plenty of early sunshine, but not much later, and may be placed under tall trees, in grass-plots, or by house-foundations.

April is the month when we must remember to re-pot the plants we grow in the house, if they happen to need it. Ferns should be re-potted now, and great care must be taken not to injure the roots. If the plant does not leave the pot easily, then the pot must be gently tapped all round. Fresh soil should be used, and plenty of crocks or broken bits of pots should be put over the drainage hole. This is important, as it helps the water to get away, and not remain to make the soil sour.

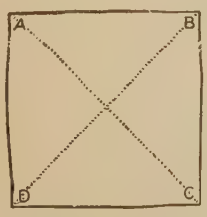
We may, perhaps, spare a small portion of our garden for vegetables, and at the same time that we sow our seeds of annuals we may also sow a line of cress. The drill should be carefully made, and the seed sown thickly.

HOW TO MAKE A PAPER BOX

ANY clever boy or girl can make a neat paper box. First, take a piece of paper, which should not be too thin or too soft. A piece the size of this page or a little smaller will do nicely. Now make the paper exactly square. You can do so easily by folding it over as shown here. Cut off the part where the folded upper piece does not cover the lower piece, and what remains will be exactly square.



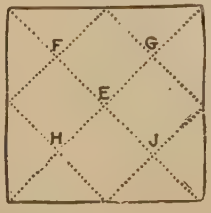
You have already folded the paper diagonally—that is, from corner to corner. Make a good crease by pressing it with the fingers at the fold, then open it out and fold it diagonally from the other corners, and press the fold well down with the fingers. The paper will now be square and creased as in this picture.



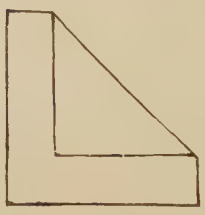
Notice the letters on the picture, so that you can understand easily what to do. So that we may understand what follows more easily, we shall call the four corners A,B,C, and D, and the centre will be E.

Now fold all the corners in carefully so as to touch the centre, and make the paper as here shown.

The paper will now be in the form of a square, but a much smaller square than formerly. Having folded it like this, press it down well at the folds so as to crease it plainly.

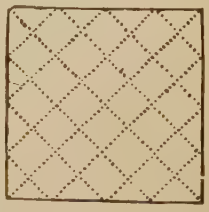


You will now have four more creases, and when you open out the paper again it will be creased where the dotted lines are in the next illustration. The other letters—F, G, H, J — mark where the creases cross. Fold the corner A over to the spot J, as seen in this illustration.



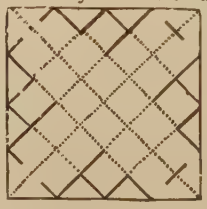
That will make another crease. Now make another crease by folding the corner B over to H; another by folding the corner C over to F; and another by folding the corner D over to G.

We still want four more creases. Make them by folding A over to F, B over to G, C over to J, and D over to H. The paper is now creased as shown here.

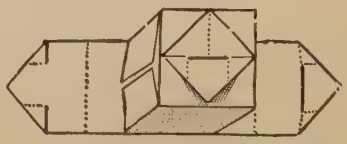


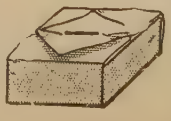
Every one of these creases is necessary to make the final box, although, as the paper is now, it is not easy to see why all these marks are wanted. But we shall see presently the use of all the creases.

Now you must use scissors. Cut along where there are black lines instead of dotted lines in the next picture.



You now have a paper which does not look very like a box. But you have only to fold it up in the proper way, and you will see that it is. Fold over the corner at D like this: and slip it into the slit near B. Now fold in the flaps at the side, and you have it like this:

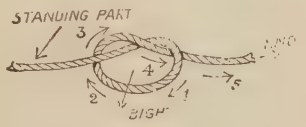




Fold over the corner at C, and slip it into the slit at A, and the box is now finished. If you have made it properly, it will be very neat and perfectly regular.

HOW THE SAILOR TIES HIS KNOTS

THERE is usually a time in the life of every boy when he wants to be a sailor. Every boy cannot be a sailor; but one part of a sailor's duties is very interesting, and a knowledge of it is likely to prove useful even to boys and men who are not sailors. That part is the making of knots and hitches and the splicing of ropes. It is easy to learn how to do these things. All that is required is a few pieces of string, a stick or a rod of wood or metal to serve the purpose of what sailors



Simple knot

call a marlinespike, or a handspike, which is used for some knots, and a little attention.

The first knot is the simple or overhand knot, seen in the first picture. We notice in the picture that one end of the rope is marked "standing part," the other end is simply marked "end," and the loop is marked "bight." We must remember these names, as we shall use them frequently in our descriptions of knots. The standing part means the part of the rope not right at the end, but a little way up, and in making a knot we always bend the end round the standing part. In some knots

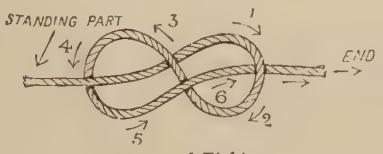
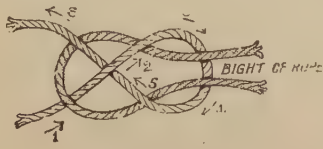


Figure of Eight

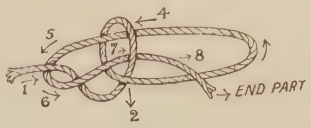
we use only one end of a rope; in other knots we use two ropes or the two ends of one rope, and in this case there are two ends and two standing parts. Sailors call a coil or a loop in a rope a bight. Also notice that in our illustrations we have small figures where there are arrows. These arrows indicate how the string or rope is threaded to make the knot or hitch; and we must follow the arrows according to the figure beside it—2 coming after 1, 3 after 2, and so on.

The next knot is what is called the "figure of eight," and from its appearance we can see that the name is appropriate. In making



Common sheet bend

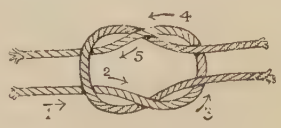
it, we pass the end of the rope round the standing part, then over "its own part" and through the bight. We understand what is meant by "the standing part"; and the words "its own part" mean the part of the rope or string that we have already bent around.



Common bowline

The next knot is what sailors call the common sheet bend. It is made with two ropes or with two ends of the same rope. We form a bight with the first end, and pass the other end through this bight, then right over both parts of the first rope, and then under its own part. By passing the second end under its own part, we jam it against the edge of the bight and prevent it slipping.

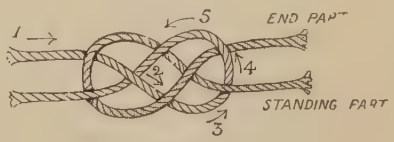
The next is called the common bowline, and is a little more difficult than any we have yet seen. We must follow the daggers in their proper order very carefully. It is made with



Reef knot

one rope or one end. Some little distance from the end of the rope we form a bight with a half-twist, thereby making a loop. We pass the end up through this loop, round the standing part, and down again through the loop.

The next, probably the most valuable knot of all, is the reef knot. It is commonly used in joining two ropes or two ends of one rope. We make a bight of the first end with the end and the standing part side by side. Then we pass the other end up through the bight, round both parts of the first end, and down through the bight again. Another way to make it is to pass the first end round the second end, then bring the two ends back to their standing parts, passing one part round the other so that



Carrick bend

two parts of each rope pass through the bight in the same direction. If we are not very careful, we shall make the ends come out one under and one over the bight, thereby making a granny knot, which is apt to slip.

The next picture shows the Carrick bend, which is also rather complicated. It is made with two ropes or with the two ends of one rope. We first make a bight of end No. 1, then pass the end of No. 2 through the bight,

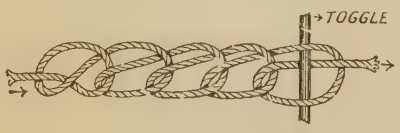
over the end of No. 1, round the standing part of No. 1, over the standing part of No. 2, and through the bight again, both parts coming

Flemish loop

out of the bight at different sides. The figures in the picture must be followed carefully in making it.

Now we come to the Flemish loop, which is made with one end only. First we make a common slip knot, and then, with the end, make an overhand knot round the standing part away from the loop.

The next illustration is what sailors know as the chain knot and toggle. It is really a number of common slip knots, which many schoolboys know as the drummer's knot, or the rat's tail. The toggle is the bar which is passed through the end loop. The chain knot is made by making a bight on the rope and crossing it. Then we pass a hand through



Chain knot and toggle

the bight and catch the standing part, which we pull through, forming a loop. We repeat this to make as many loops in the chain as we may think we want. Then we pass the bar, or toggle, through the last loop, and haul on the end to tighten up all the loops.

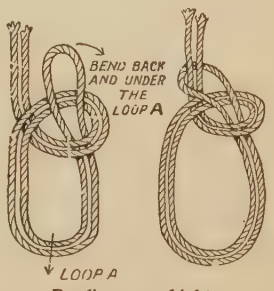
The next is a sheepshank, in the language of sailors. It is generally used to shorten a rope on which there is a strain. A piece of the middle of the rope is held so as to form three parallel strands, or two bights. Round the end of each bight we make a hitch with the part leading to the end. As long as there is a strain the knots hold securely. When we wish to let the rope out again to its full

Sheepshank

length, one of the long ends of the bight can be prised out, or one of the hitches slackened, and the rope withdrawn.

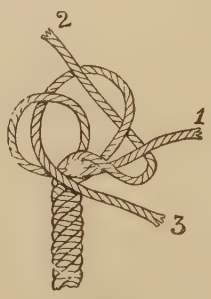
The next is what is properly termed a bowline on a bight; and, to indicate clearly how to make it, there are two pictures, one showing it half made and the other showing it completed. We double the rope, and make a bight with it doubled. Then we pass the doubled end under, and up through the bight, and back over the whole loop, and up to the part above the bight. The picture shows more clearly than words how this is done.

The wall knot is a neat way of finishing off a rope and of preventing it from unlaying, or coming apart. It is made in two stages. We untwist the three strands of which the rope is made for a distance sufficient to give us three cords about 8 inches long. Let us call these strands Nos. 1, 2, and 3. We make a bight with strand No. 1 and pass strand No. 2 round the end of it; then we pass strand No. 3 round the end of No. 2 and through the bight of No. 1. Finally we haul the ends tight, shaping the knot evenly with the fingers as we do it. The wall knot requires a little practice to do it neatly, but it is not so difficult as it looks.



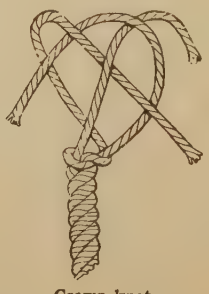
Bowline on a bight

The crown knot is the wall knot carried a little further. We make a wall knot as already described, and then take strand No. 1 over the centre of the wall. Now we place strand No. 2



Wall knot

over No. 1, and strand No. 3 over No. 2 and under No. 1. Then we pull them all tight, shaping the end with the fingers as we do so, and the crown is complete.



Crown knot

At another time we shall be able to learn how a sailor makes various hitches and also how he splices the ends of two ropes together.

GAMES TO PLAY SITTING BY THE FIRE

NO boy or girl need ever be dull on a dark night or a rainy day. There are hundreds of ways of enjoying ourselves by the fireside, and here are some games that we can play as we sit, even without moving from our chairs.

BUZ

PLAYERS take it in turn to count up to 100, but instead of saying "seven" the word "Buz" must be used, and repeated at fourteen, twenty-one, and all the multiples of seven. When the number 70 is reached you say "Buz"; for 71, "Buz one"; for 72, "Buz two," and 77 is "Buz Buz." If "Bang" be used also at every fifth interval, someone will surely have to pay forfeit.

RHYMES

THE player at one end of our row says: "I'm thinking of a word that rhymes with *rip*" (though any word may be chosen). Then each in turn tries to guess what the word is by asking a question, thus: "Is it something that sails on the sea?" If wrong the thinker replies: "No; not a ship." Another perhaps asks: "Do we partly speak with it?" "No; not *lip*." "Can we do it with a rope?" cries a third. "Yes," answers the thinker, "the word is *skip*." Then the guesser chooses a word and the game begins again.

HOW, WHEN, AND WHERE?

ONE of the party must leave the room while the rest select a word to be guessed. The player is then called back and begins the task of finding the word by asking each of the party the three questions: How do you like it? When do you like it? And where do you like it? Supposing the word to be a simple name like "tea" or " sugar," the answers will soon reveal it; but the game can be made more difficult by choosing a word with two meanings, such as "pen." This may either mean the little tool we write with, or the pen that sheep are folded in.

I LOVE MY LOVE

WHOEVER sits first in the row is A, and says: "I love my love with an A, because he is affable" (or anything nice beginning with the first letter of the alphabet). "I hate him with an A, because he is artful" (or something else *not* nice). "He took me to Aden and gave me some apples. His name is Andrew, and he comes from Aberdeen." Of course, these last descriptions of "my love" may vary as the player wishes, just as the first do. The next player uses words beginning with a B, and so on down to Z.

RUSSIAN GOSSIP

THIS game will show you how easily a story grows. No. 1 whispers to No. 2 a short sentence. No. 2 repeats it to No. 3, adding an adjective or an adverb. No. 3, in telling it to No. 4, adds another word, and when the story reaches the last player he, or she, repeats it aloud. You will be surprized to find how the story has grown since starting from No. 1.

SPELLING BEE

THIS is a game for clever children. The first player begins a word, which he does not tell, starting with A, the second player adds a letter, and all the other players do so in turn. The player ending a word drops out or pays forfeit.

Suppose the first player says T, the second R, the third E. Now comes the critical moment; if the fourth player says E, he finishes a word—Tree. But if he is clever he will say A, and then the fifth player may, perhaps, say T. But he need not do so, as he can say S, leaving the next player to say U. Then the next might say R, and the next E, which would end the word Treasure. If the eighth player is clever, however, he will say I instead of E, so that the tenth player must make the word Treasuring or Treasuries.

The great point of the game is to keep a word up as long as possible, but, of course, some words must end. No proper names are allowed, and it is best not to count words of three letters. The game should be played through from A to Z, the first word beginning with A, the second with B, and so on.

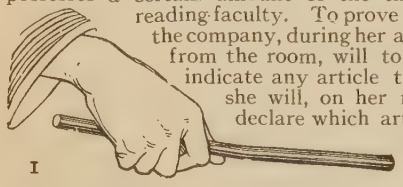
HIDE AND SEEK ON THE HEARTHRUG

ONE of the players is counted out to go and hide, but, without leaving the circle, thinks of some good place in which it may be supposed he or she is hiding. Having called "Cuckoo!" the others begin guessing one spot after another until the right one is hit upon, when the guesser hides in turn. In such a game the hiding ground may be anywhere in the world: "A street in Paris," or "The top of Pike's Peak." Each player takes it in turn to ask questions as to the whereabouts and nature of the hiding place; but as the one who is answering may only say "Yes" or "No," the seekers may have a long search. It is their business to question the hidden one so that his answers "Yes" or "No," give some idea of the place. For example they will naturally ask whether it is far or near, high or low, and so on.

THE MYSTERY OF TELEGRAPHING THOUGHT

WE have all been baffled at times by the wonderful way in which a lady sitting on a platform at one end of a hall has been able to tell what a gentleman at the other end has in his hand, and this strange system of "thought-reading" is really very simple. The boy or girl who would learn to play this magical duet must practise diligently till each is perfect in the part they have to play—that is all.

Let us suppose that the duet is played by a boy and his sister. When the eventful night comes the boy introduces the lady as his "medium." Being a medium, she naturally possesses a certain amount of the thought-reading faculty. To prove this, if the company, during her absence from the room, will touch or indicate any article therein, she will, on her return, declare which article it was. There are several ways by which the performer may impart the necessary information. One of the simplest is to arrange that when he asks for, say, the sixth time "Is it this?" the question is to be answered "Yes." For a second attempt it may be arranged that the eighth or ninth question shall furnish the clue.



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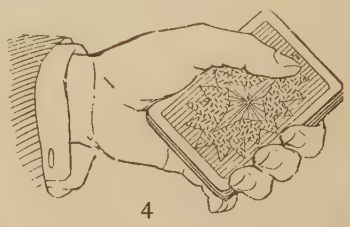

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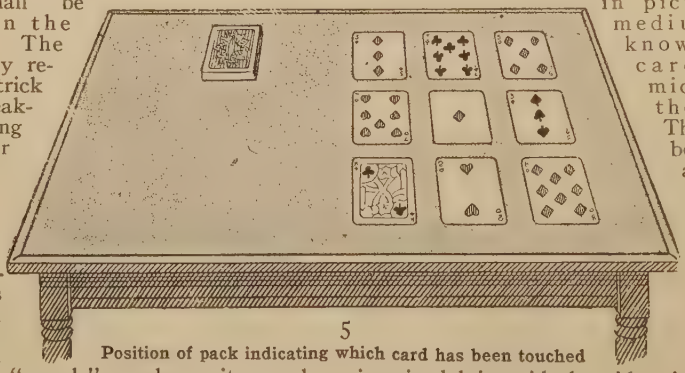
The methods of telegraphing thought with a magic wand and a pack of cards

Another plan is to agree that whenever the performer's question refers to a four-legged object, say, a chair or a table, the one next following shall be answered in the affirmative. The performer may repeat the trick without speaking at all, using a ruler or paper-knife as wand or pointer, merely touching or indicating various objects in succession. Where he points with a "wand," as above, it may be agreed that, so long as the performer holds the wand as shown in picture 1, the medium is to answer "No" to all his questions; but if the forefinger is shifted so as to lie along the wand as in picture 2, the answer is to be "Yes." The same principle may be carried a good deal further, as in the following capital trick. During the absence of the medium a pack of cards is first well shuffled; a great point should be made of this, because it has nothing whatever to do with the trick. Nine cards are then dealt face upwards on the table in rows of three each. One of these is "touched" by one of the company. The medium, on her return, after a little cogitation, names the card.

Here the row in which the card stands is indicated by the manner in which the performer holds the wand. If between the forefinger and thumb only, the card is in the first row; if encircled by two fingers, in the second; if grasped by the whole hand, in the third. The number at which it stands in the row is revealed by the position of the left hand. If this grasps the lapel of the coat the card is No. 1. If the thumb is in the vest pocket, No. 2. If the hand hangs down by the side, No. 3.

Another method of telegraphing is by the position of the performer's thumb on the back of the unused cards. For this purpose you must imagine the surface of the top card as divided into nine portions, numbered as indicated in picture 3. The performer indicates the card touched by holding the pack so that his thumb shall rest on that part answering to it in position. Supposing it held as shown in picture 4, the medium would know that the card was the middle one in the first row. The trick may be repeated in a still more surprising way.



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Position of pack indicating which card has been touched

Suppose the nine cards laid on the table as in picture 5. A similar group is imagined lying side by side with it, and the pack is left by the performer in that position which in the imaginary group corresponds with the card touched. Thus the pack laid as in picture 5 would indicate that the middle card in the top row is the one.

HOW TO MAKE CANDIES

WILL some one kindly explain why the recipes for candies are always tucked away in the back of the cook book? Perhaps they are hidden away in the back pages because they are lonesome.

No little girl ever waits until she has studied all the recipes in the front of the book before she makes candies. So right here in the very first volume we will give simple directions for making some very delicious candies.

This page is quite as much for boys, for what is more fun than a candy-making party on a cold or rainy day when we can not go outside! The small boy — and the big one too — loves to wear sister's big cooking apron and take a hand in mixing things.

It is useful to know how to make candy, for sometimes we can not find the varieties we want in the stores. Then, too, homemade candy is much better, purer and really cheaper than the kind we buy at the shop. A box of candy you have made yourself is a most welcome gift for a birthday.

Most people like candy, and that includes "grown-ups" as well as the little folks. And why should we not enjoy good wholesome candy, for it has its own food value. It is only cheap candy that is dangerous, so when making candy always use the best materials.

PEANUT TAFFY

THIS candy is very popular. The materials needed are two cups (one pound) of sugar and a quart of peanuts. Shell the peanuts, remove the brown skins and chop. Sprinkle with a quarter teaspoon of salt. Put the sugar into a perfectly smooth granite pan, and place it on the range over a moderate fire, stirring constantly until the sugar is melted. Remove from the fire, add the peanuts, and pour into buttered tins. You must be quick, for if not removed right away, the sugar will caramelize, which means it will turn dark brown, or almost black.

In place of the peanuts one cup of halved walnuts, or one cup of cocoanut, or crisp puffed rice may be added.

If you wish to make this candy in larger quantities for a fair, here is a rule to remember about the proportions. Measure the chopped nuts, and use just the same quantity of granulated sugar as you have peanuts. Cut into squares before it cools.

PENOCHE

THE materials needed are two cups of brown sugar, ½ cup of milk, 1 tablespoon of butter, ½ cup of pecan meats, and a teaspoon of vanilla. Put the sugar and the milk into a saucepan, and stir until the sugar dissolves. After it has boiled ten minutes, test it. If it forms a soft ball in water, or if the candy thermometer reads 240°, remove from the fire. Stir in the butter, the chopped nuts and vanilla. When it is cool, cut into squares. If you want to vary the penoche, use one tablespoonful of peanut butter, instead of the nut meats.

POP CORN BALLS

SOMETIMES we make popped corn and wish we knew how to make it look attractive to serve. Here is one way of making it delicious. Put one cup of granulated sugar, one cup of water, and ¾ cup of corn syrup or glucose into a saucepan, and stir constantly until it is dissolved. Cook until the candy forms a rather soft ball when tried in water, or until the thermometer reads 240°. To test it, roll between the fingers in the cold water. Remove from the fire, add a teaspoonful of vanilla, and pour slowly over the popped corn, stirring it well. If you moisten your hands with cold water, it is easy to press a lump of corn into a ball.

PEPPERMINT CREAMS (UNCOOKED)

SOME people prefer to cook the fondant for peppermints, but it is much easier to make a fondant that does not require cooking. Here is a simple way to prepare it. Break the white of an egg into a dish, add a few drops of peppermint extract. Stir in a little confectioner's sugar, and gradually add more sugar until the mixture can be molded easily. Roll it with a rolling pin, and stamp it into rounds with a small cutter. Place the candies on waxed paper and let them dry.

BUTTERSCOTCH

PUT two cups of granulated sugar, two tablespoons of butter, and two tablespoons of water all together in a saucepan, and cook without stirring. In fifteen minutes try a little bit of the mixture in cold water, mark into squares when cool.

LITTLE PROBLEMS FOR CLEVER PEOPLE

THESE problems are continued from page 110, and below are answers to the problems appearing on that page.

THE CLOCK STRIKES TWELVE

14. George and his sister stood under the church tower and heard the clock strike six. George looked at his watch while it did so, and said to his sister: "It took thirty seconds to strike six." His sister replied: "Then how long would it take to strike twelve?" George replied: "Sixty seconds, of course!" George was wrong. What is the correct answer?

HOW DID HE MEASURE THE MILK?

15. Mrs. Thomson ordered four quarts of milk from her milkman, who had eight quarts in his can, but no measure by which he could measure it. Mrs. Thomson had two jugs, one able to hold five quarts and the other three quarts. The milkman said that he could not measure four quarts with these, but Mrs. Thomson's little boy, Charlie, showed him how to do it. How did he do it?

HOW MANY EGGS?

16. If a hen and a half lays an egg and a half in a day and a half, how many eggs will one hen lay in six days?

TWELVE EGGS IN BASKET

17. There are 12 boys, and on the table is a basket with 12 eggs. Each boy took one egg, and there remained one egg in the basket. How was this?

THE FARMER AND THE TRAMP

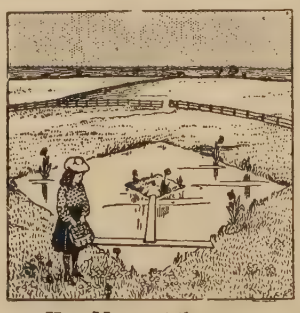
18. A tramp lies down for a nap at the side of a haystack, and hears the farmer approaching. He runs round and round the stack, chased by the farmer. They start from opposite corners, the tramp taking forty seconds to run completely round, and the farmer thirty seconds. How often must the farmer run round before catching the tramp?

THE ANSWERS TO PROBLEMS ON PAGE 110

1. No; George never sees the monkey's back, which he clearly would do if he walked round the monkey.

2. Mabel bought six apples, which cost 8 cts., and six oranges at 1 cent each, making 6 cts. for the oranges and 14 cts. for the whole. The simplest way to find this is to count what she paid for three of each, which would be 4 cts. and 3 cts., making 7 cts.; and 14 cts. is exactly double 7 cts., so she would get twice three of each for 14c.

3. Mary put the planks as shown in the picture, and thus reached the island.



How Mary got the eggs.

4. Tom's uncle's sister was Tom's mother.

5. This one is not so easy as the others. Let us find first how many stamps were left when Jack had taken his share. Seeing that Frank had one more than half, Harry must have had one less than half. You know that Harry had three, therefore four must have been half the quantity that Harry and Frank divided. Four is the half of eight, so that Frank had five, which is one more than half of eight. Now we must find how many Jack had. Jack's share was one more than half of the total quantity, and therefore the quantity divided by Frank and Harry must have been one fewer than half of the total. Frank and Harry's share came to eight, as we have seen; and the half of the total quantity, being one more than eight, was nine. Jack had ten, which is one more than half of the total quantity, and there were thus eighteen stamps altogether.

6. To begin with, one piece of string was 12 in. long and the other piece 24 in. After cutting 6 in. off each, the shorter piece was 6 in. long and the longer piece 18 in. long.

7. If a man says that he has no brothers and sisters, his father would have only one son—himself. Thus, if what he says is put in simple language, it is: "That man's father is myself." This means that the picture at which he looked was that of his own son.

8. You have probably guessed that the cork cost 1 cent, which is wrong. Since the bottle cost 4 cts. more than the cork, if we take away 4 cts. it leaves 1 cent to be divided between bottle and cork, which is ½ cent for each. The cork, then, cost ½ cent.

9. Suppose we first give each of the children 25 cents. This will use $12.50. We have $2 left, to be used in giving another 5c. each to the boys. Now there are 40 5c. pieces in $2, so there must be 40 boys. Therefore there are 10 girls.

10. The messenger brought 2½ canaries, and 1½ times as many as there were left in the cage. Counting those in the cage, then, there were 2½ times as many as were left, and 2½ canaries. But there were 20 altogether. Taking away the 2½ canaries, we see that 17½ canaries is 2½ times as many as were left in the cage. Or, what is the same thing, 35 canaries is 5 times as many as were left in the cage. There were 7 left in the cage; and so there were 13 which flew away.

11. In fifteen minutes I had gone 1 mile, and the horse 220 yards less than 1 mile. In one hour the horse would walk 880 yards less than 4 miles—that is, 3½ miles in one hour.

12. The brick weighed 12 lb. The weight of each of two halves is the same, so that if a brick weighs half its own weight and 6 lb., the 6 lb. must represent the other half.

13. She got 16 for 24 cts, being 18 cts. per dozen. Had there been 18 for 24 cts., the price would have been 16 cts. per dozen.

THE NEXT THINGS TO MAKE AND THINGS TO DO BEGIN ON PAGE 379. ANSWERS TO PROBLEMS PAGE 491.

KATE BARLASS OF THE BROKEN ARM

CONTINUED FROM 139

KING JAMES the First of Scotland was a good king; but when he came to the throne, nearly 500 years ago, the country was in such disorder that he had to be very stern and severe to keep the powerful nobles from wrong-doing; therefore many of them were full of hatred towards him. Then certain of these, headed by Sir Robert Grahame, conspired together to slay the king.

Now, it happened that the king went one winter to the town of Perth to hold high festival, with his queen and some of her ladies, and abode in the Abbey of Perth, while his followers were scattered over the city; and here the traitors got their chance of catching him unguarded. To make matters easier, some servants were bribed to remove the bolts and bars from the doors. And so it befell one night, when all the king's men had gone from the abbey, and he was sitting unarmed with the queen and her ladies, that a great clatter of weapons was heard without. Thereupon he guessed that his foes had gathered to murder him, nor could he fight them, being himself unarmed. But there was a vault under the chamber, and he wrenched up boards from the floor and leaped down. The ladies quickly put back the boards and covered them before the traitors rushed in. And they, not finding him, searched for him high and low. Then the king and the ladies in the chamber, seeing that the danger was passed, began to move the boards, so that James might come out again. And, even at that moment, they heard the clatter and clash of arms again. For one of the traitors had bethought himself of that vault, and they were hurrying back. What chance of escape was there for the king? There would be no time to cover all up before the conspirators broke in; and on the door was no lock or bolt to stay them—only the iron rings where the bolt should be.

Quick as thought, one of the queen's maidens, named Katherine Douglas, sprang to the door and thrust her arm through the rings on the door, crying out that the men must not enter, since there were none in the room but ladies who were disrobing. But the fierce men outside paid no heed to that, and beat upon the door; and how should a maiden's frail arm suffice for a bolt against their battering? Alas, poor Katherine's arm was snapped, and the wicked men burst in, and, seeing where the floor had been disturbed, leaped down and slew the king.

For that brave deed, in vain though it was, the name of Katherine Douglas became renowned throughout the land, and men called her Kate Barlass—the maid who barred the door with her tender arm in an attempt to save the good king's life.

THE BRAVE DEED OF A YOUNG AMERICAN DOCTOR

AMONG the hills of Greece a terrible battle was waging between the Greeks and the Turks. For hours the rifles had cracked and the sabres flashed. The dead and wounded lay heaped under foot. A cloud of smoke hung heavy over the battlefield. The air was rent with battle cries, and through all could be heard the moans of the wounded.

At the forefront of the Grecian battle-line a young man on a black charger dashed hither and thither, urging the soldiers on with his cries—his own blade doing doughty work. Before the on-coming horde of turbaned Turks the Greek line wavered and broke.

"What! Cowards! Would you fly before the dastard Turk!" hoarsely shouted the young man on the black horse, flourishing his sword. "Rally to the flag, men, rally to the flag!"

But his words were swallowed up in the din of the enemy. The Greeks were flying. Pressed upon by the foe, the young man was obliged to turn and follow his retreating comrades. He found himself riding by the side of a young Greek soldier—their horses were straining neck and neck to outstrip the merciless foes who shrieked behind. One of the foremost Turks caught up with them for a moment. There was a flash of steel through the air, and the young man dimly noted that the tunic of his companion was red and wet.

"Lie low on your saddle!" he cried hoarsely, as the bullets whistled about their heads. Suddenly, he saw the Greek boy reel and slip from his horse. With a tremendous wrench he brought his horse to a standstill and leaped to the ground. Reaching down he caught up the wounded Greek, but the Turks were upon him. He fought them off, sword clanging against sword, and flung himself upon his plunging horse, dragging the boy up with him. The blood spurted from his wounds, but he clung to the saddle, the limp body in his arms, and leaning low over his horse's neck, urged him furiously on. The horse, frothing and snorting with terror, tore over the ground, and the Turks, bereft of their prey, howled behind. The breath from their horses' nostrils scorched the young man's legs.

Then with one last spurt his great black horse surged ahead and plunged into the torrent whose opposite shore meant safety. The bullets spit and whistled through the air. One grazed the young man's arm; another clipped a curl from his dark head. But the opposite shore was reached at last. Panting and reeking with foam the horse scrambled up the slippery bank. Wheeling about the young man waved his hand in derision at the swearing Turks upon the opposite shore and, turning, plunged into the forest upon the mountain side, the rescued soldier lying across his saddle bow.

The man who performed this noble deed was Samuel G. Howe, a young American surgeon who had joined the Greeks in their brave struggle for independence from the power of Turkey. Dauntless as a soldier, his skilful hand was as gentle and skilful as a woman's in helping the sick and wounded. Everywhere he went he established hospitals for the suffering soldiers, and when matters grew desperate and the Greeks were dying around him on every side from starvation, he hurried home to America to procure aid. Through the newspapers, by thrilling speeches and personal appeals, he obtained money for the help of his comrades, and returned to Greece in a ship laden with generous offerings from the American people.

How the Greeks blessed the man and the nation who had been so generous to them! And when the war was over, and they had won their freedom from the cruel power of Turkey, they sent a vote of thanks to the brave young American doctor who had helped them so nobly.

THE NEXT GOLDEN DEEDS ARE ON PAGE 333.

WHAT OUR LESSONS WILL TEACH US

WE shall not learn in our book all that we must know when we are grown up and go to school, but we shall begin to learn many things which will help us at school and help to make us useful when we grow up. Everything we read in the Book of Knowledge will be useful to us and make our school life easier, but in this part we shall learn some special things. We shall learn what figures are, and the wonderful things that can be done with them. We shall try to draw pictures of the things we see at home and in the streets. We shall learn how to read and write, so that we can read the story-books ourselves and write letters to our friends. We shall find out all about music and what a beautiful thing it is, so that we can learn to play the piano and sing; and those who are learning French will find here little stories written in French which they will be able to read and understand. All these useful things we shall learn just as if this were our school, and we shall find them as interesting as real stories.

WORD-BUILDING

HOW TO LEARN THE A B C

BEFORE we can read our story-books ourselves we must learn our letters. Then, when we have learned these, we shall be able to make words and read them, and when we can read we shall find that nothing in the world brings us more happiness than reading books.

There are twenty-six letters in the alphabet, and we can write them in two ways, because sometimes we want to write them big and sometimes little. Here they are all together, the little letters and the big letters side by side.

The Big and Little Letters of the Alphabet

Aa	Ee	Ii	Ll	Pp	Ss	Ww
Bb	Ff	Jj	Mm	Qq	Tt	Xx
Cc	Gg		Nn		Uu	Yy
Dd	Hh	Kk	Oo	Rr	Vv	Zz

We must learn these letters until we know them as well as we know our names, and it will help us to remember our letters if we learn the Animal Alphabet on the next page. That is an easy way of learning A B C, and we must read the Animal Alphabet, and say it over and over again until we can say it through without a mistake. Here is another way of remembering where the letters come; it is a little rhyme telling us the place of each letter:

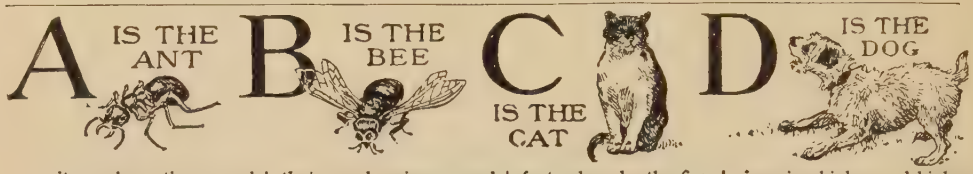
A before **B**, **C** before **D**,
F after **E**, **H** after **G**,
I before **J**, **L** after **K**,
M before **N**, **O** and **P** then;
R after **Q**, then **S**, **T**, **U**,
V and **W** next come to view;
with **X**, **Y**, and **Z**, all the letters are said.

Then we must learn to put the letters together and make words, and we shall find it very interesting, as we get along with our lessons, to see how the letters come together to make the very words we know.

I F spells **IF**	**O F** spells **OF**	**W E** spells **WE**	**G O** spells **GO**
I N spells **IN**	**O N** spells **ON**	**B E** spells **BE**	**N O** spells **NO**
I S spells **IS**	**O R** spells **OR**	**H E** spells **HE**	**S O** spells **SO**
I T spells **IT**	**O X** spells **OX**	**M E** spells **ME**	**T O** spells **TO**

Pictures will help us to learn the words, and a clever artist has drawn some pictures to show us what the words below them mean, on p. 452.

THE CHILD'S NEW ANIMAL ALPHABET



as it crawls on the ground | that goes buzzing around | fast asleep by the fire | jumping higher and higher

that you hardly can hold | rather cunning than bold | with its toes stretched out wide

will you go for a ride? | that looks like a goat | with its harsh screeching note

hopping along | majestic and strong | who of cheese is so fond

as he swims in the pond | who feeds upon fish | with his snout in the dish

such a fat little bird | so cosily furred | with his tail up his back

streaked yellow and black | unknown to-day | who swoops on his prey

that Red Riding Hood saw | with snarp-pointed jaw | just hark how it pipes! | with beaufiful stripes

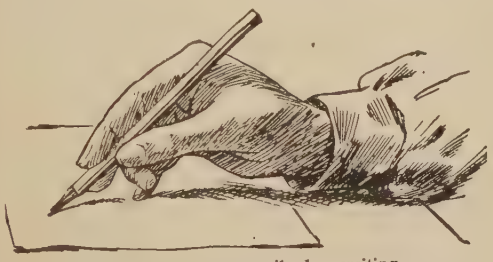
HOW TOM AND NORA LEARNED TO WRITE

"A BOX for Master Tom, and a box for Miss Nora," said the postman, as Tom and Nora came to the door one morning.

"Two beautiful boxes of crayons," said the mother, when the parcels were opened; and there, neatly tucked away in the little wooden bed, lay six colored chalks, the very things Tom and Nora had wanted. For Tom and Nora longed to learn to write to their Cousin Jack, who lived in America, and have the letter carried thousands and thousands of miles across the sea in a ship, and over the mountains and along the great railways of the great country where the oranges grow.

"Oh, mother," cried Nora, clapping her hands, "do let us begin now! We could tell Jack all about our birthdays. May we begin at once?"

"Yes," replied their mother, "you shall start now. Bring the ruler and



How to hold your pencil when writing.

pencil, and Tom can ask father for some sheets of unruled paper."

These were brought, and Nora and Tom watched their mother rule two lines.

"They are like railway lines," said Tom.

"They are your crutches," said his mother.

Nora thought it very strange that Tom should want crutches, which are for lame people, because he wasn't lame at all when he ran out of the room to fetch the paper; and she laughed merrily when her mother told her she would want crutches also.

When two sets of lines had been ruled, one for Tom and one for Nora, they were told to watch how their mother held the pencil firmly between her thumb and the first two fingers, with the little finger resting on the paper, and her arm between the wrist and the elbow resting lightly on the table, as in the picture.

"People hold their pens and pencils in different ways," the mother said; "but we will learn a good way, which is easier in the end. See how nicely you can make a little stroke over a stroke that I am going to make, and then make some strokes quite by yourselves. Watch me."

Then she made four strokes, nearly straight down, from the top line to the bottom one, and put little marks where the children were to start making strokes themselves. The mother's strokes, when they were finished, were like this:

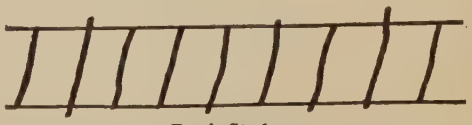
Tom and Nora wrote over their mother's strokes with their blue chalk, and then tried hard to make strokes themselves.

When they had finished, Tom said that his railway lines looked like fences leaning sideways; and Nora told her mother that she understood why the long lines were like crutches, "because," she said, "they really did help us along. Will you make us some more, please?"

This time the mother drew two lines without the little marks where Tom and Nora were to begin.

"Write inside the lines, and find out where to begin for yourselves," she said.

"Hold your chalk more lightly, Tom; and sit up straight, Nora. Now start, and don't write too fast, or you will write badly."



Tom's Strokes.

Nora's Strokes.

When they had finished, Nora's strokes looked nicer than Tom's.

"That is because she ended them on the lines," said their mother.

Some of Tom's strokes went outside the lines, and were not quite straight. Nora kissed him and said, "Never mind,

Tom; I am older than you, so I *ought* to write better."

During the next few days they wrote many rows of strokes, until they were able to make them quite straight, and the right distances apart.

Then their mother told them that they had been making the figure 1, which is the same as a stroke, and now that they could do that, they were ready to begin making a letter of the alphabet.

Nora said she would like to begin with A B C, and learn how to write all the letters she had learned; but her mother said that that was not an easy way.

"Then let me begin with N," said Nora, because her own name began with N; and Tom thought he would like to make his own letter T, though he would not say so, because he was not selfish.

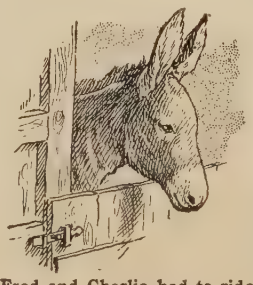
But when their mother said they should make the letter i first, because that would do for all three of them, they both thought it a capital plan.

"We will learn to make i to-morrow," they said, as they put their crayons into the boxes and went off to bed themselves.

HOW FRED AND CHARLIE COUNTED SIX

FRED and Charlie have been on a visit to their uncle's farm. They had such a good time there, and are never tired of telling us about the things they did, and the animals they saw—the cows and horses, the sheep and pigs, the ducks and geese and turkeys.

The first morning of their visit they got up very early, because Uncle Jack had promised to take them for a walk round the farmyard and through the fields. As soon as they had had breakfast, they started out. The first thing they saw was Jimmy, looking at them over his stable door. Jimmy was the donkey. "I should like a ride on the donkey, Uncle Jack," said Fred. "Very well, we'll see about that when we get back from our walk." But, of course, Charlie wanted a ride, too. So Uncle Jack said they would have to take turns, because there was only one donkey. First Charlie could have a ride, and then Fred, because Charlie was younger than Fred.



Fred and Charlie had to ride in turns, because there was no other donkey except Jimmy.

The boys were so pleased at the thought of the donkey rides they could talk of nothing else till they had gone quite a long way, and come to a field where old Jake was ploughing. "Whatever is old Jake doing, Uncle?" asked Fred.

"He is ploughing," said Uncle Jack, "making the ground ready for sowing the corn. The field is too big for a man to dig it all with a spade, so it is done with a plough. You can see how the plough turns the soil over, as the horses drag it along. It would be very hard work for one horse, so we put another one with it."

"I know how many horses that makes," said Fred. "Charlie doesn't, because he's never been to school, so he can't count."

"Well, you tell him how many horses it makes, and he'll soon learn."

"Why," said Fred, "one horse and one horse make two horses."

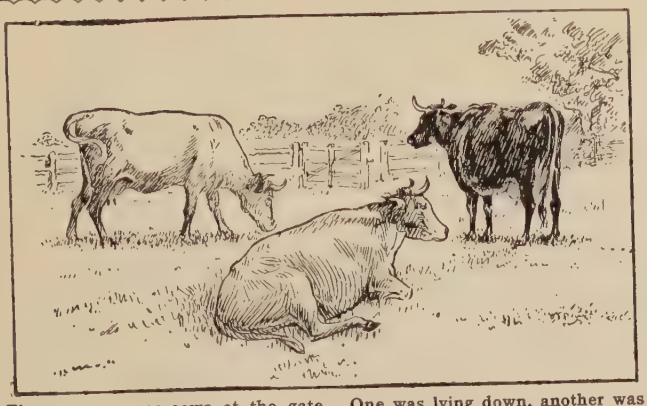
"Quite right. And if you have a ride on the black horse, and a ride on the grey horse, as well as a ride on the donkey, how many rides will that be?"

"Three rides," said Fred. "Two rides on the horses and another one on the donkey make three rides altogether."

The plough would be very hard work if it were pulled by only one horse, so the farmers put another with it, making two horses.

"That's the way; we shall soon teach Charlie to count."

By this time they had come to the meadows. "I believe Charlie can tell us how



There were some cows at the gate. One was lying down, another was eating grass, and another standing looking at the boys made three.

many cows there are standing by the gate," said Uncle Jack.

"Oh, yes!" answered Charlie. "There's one lying down, and another one eating the grass. That makes two. And there's another one standing looking at us. That makes three."

And so they went along, with Charlie, I am afraid, thinking a great deal more about donkey rides than about learning to count. Still, you see, he was learning, because he remembered, after seeing the plough, that one horse and one horse made two horses, and that a ride on each of the horses and a ride on the donkey as well made three rides altogether; and so he was able to tell Uncle Jack that one cow lying down, one cow eating the grass, and one cow standing looking at them made three cows altogether. Presently, as they came through a gap in the hedge, Charlie saw something else that he could count — one, two, three little rabbits.

"Oh, I can see more than that!" said Fred. "There's another one sitting up a little way from the others. That makes four."

But the boys made such a noise that the rabbits were frightened, and ran away as fast as they could. Now, when rabbits run away it is very easy indeed to see them, because they have such white tails; so it turned out that there was another one yet, besides the four that Fred saw, and, as Uncle Jack said, that made five.

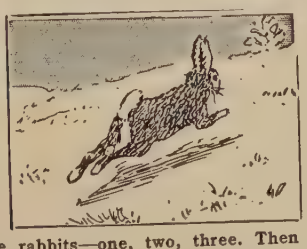
Charlie was really getting on fast with his counting now. Three rabbits and one rabbit more make four; four rabbits and one more make five. Before they got home again he was able to count as far as six. He counted five crows, busy looking for something to eat, and just as he had said "One, two, three, four, five," another crow came down from the tree where it was sitting, so that now there were six of them. Charlie was very pleased indeed with himself when he found he could count as many as six things. He was busy with his counting on the way home, and his uncle gave him this little rhyme to help him to remember up to six:

Charlie counted five crows looking for something to eat, and just as he had said "One, two, three, four, five," down came one crow and made six.

One, two, the cock crew.
Three, four, hear the bull roar.
Five, six, the clock ticks.

"I can make a better rhyme than that," said Fred.

One, two, we are going to the Zoo.
Three, four, we shall hear the lion roar.
Five, six, see the monkey at his tricks.



Presently Charlie saw some little rabbits—one, two, three. Then Fred caught sight of another sitting up a little way off. That made four. But the boys were so excited that they almost missed another little rabbit running away, and, as Uncle said, that made five.

THE WONDERFUL LAND OF SOUND

I WANT to take you to the wonderful land of Sound, a country so beautiful that we will call it our Magic Kingdom.

In this Kingdom there are Fairies who will sing to us, and when we know them, and can understand their language, they will tell us stories of the winds, they will bring to us the songs of the birds, the murmur of the brook, and all the beautiful sounds in the world.

In this wonderful Fairyland, also, we shall find little black Goblins; but they are good-hearted Goblins, as kind as they are black, for in this beautiful land Fairies and Goblins help one another, and join together to tell us the most delightful stories.

We have all seen this Magic Kingdom, which is in nearly all our homes. We call it the *Piano*. Whenever I am there, I am so happy that it makes me want to show you the way, and help you to understand all the beautiful things which the Fairies whispered in the days of long ago.

Let us open the door of this Fairyland. Inside we see what looks like a long black line and a long white line. If we look closely we see that these lines are really made up of about fifty little white pieces and not quite so many little black pieces. The fifty little white pieces are where the Fairies dwell, the black pieces are the homes of the Goblins. The Fairies live in the white houses and the Goblins in the black ones.

The Fairies are very simple little people, and like to make it quite easy for us to talk to them, so they have very short names, which all of us will find easy to remember. There are only seven of them, so they have taken the names of the first seven letters of the alphabet. Let us say to ourselves, "Seven little Fairies, seven little names."

A B C D E F G

FAIRY A FAIRY B

FAIRY C FAIRY D

FAIRY E FAIRY F FAIRY G

This is the Row of Black and White houses in which the Fairies and the Goblins live. Try to pick out all their places so that you can remember them.

We will not talk about the Goblins' names to-day, but there is something important that we must notice particularly. The homes of the Goblins—the thirty-five little black houses—are arranged in twos and threes, and this arrangement is a great help in finding out and remembering the homes of the Fairies.

In nearly all pianos Fairy A has eight houses. They all look exactly alike, and all are named A, after Fairy A herself.

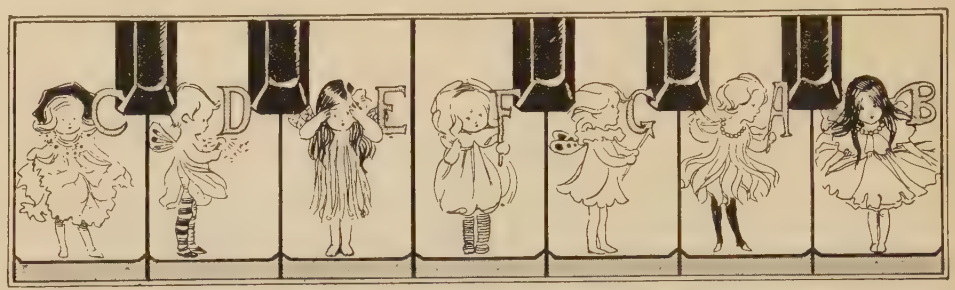
We must find out where Fairy A lives, and must first of all notice the group of three black houses. Look carefully at these three Goblins' homes, and then remember that Fairy A lives on the *right side of the middle black house.*

Fairy B is satisfied with seven homes, all exactly alike, and each one is named after herself, B. Again we must notice the three little black houses, because Fairy B is always found on the *right side of the third little black house.*

Fairy C has seven houses, all named C, after herself, and they are on the *left side of the TWO little black houses* grouped together.

HOMES OF THE SEVEN LITTLE FAIRIES

These pictures show you the seven little Fairies in their homes, each Fairy carrying her name. Notice how the little black houses of the Goblins that guard the fairy houses are arranged in twos and threes.



Here again are the seven little Fairies, all in their homes in the Land of Sound—A, B, C, D, E, F, G

Fairies D, E, F, G have also seven homes each, and each of these little houses bears the name of the Fairy to whom it belongs. Let us see where they live.

Look again at the little group of two Goblins' houses. The little Fairy living *between these two black houses* is Fairy D, and wherever we see just two Goblins together we can be quite sure that Fairy D is to be found between them.

Fairy E feels that she wants to be one of this happy party, and she has her home next to D, so that Fairy E is on the *right side of the second black house.*

Fairy F and Fairy G like a group of three Goblins, so Fairy F lives on the *left of the first of the three black houses,* while Fairy G lives next door to her, on the *left side of the middle black house.*

Now we have found out where all the little Fairies live. Let us look at the pictures very carefully, and then go to the Piano, and see if we can find the little houses all ready and waiting for us there.

Every day we will enjoy a real game of play with the Fairies and Goblins in the Magic Kingdom. We can think we are the postmen of Fairyland, and each morning we must take the Fairies their letters, being sure to go to the right houses, and careful not to forget any of our little friends.

DRAWING

HOW TO MAKE YOUR FIRST PICTURE

WOULD you like to learn how to draw, and to be able to make pictures of the things you see?

It is really easier to learn how to draw than to learn to write, though it isn't easy at first to draw things like houses, or horses, or cows. Yet all the lovely pictures that hang on the walls are drawn by people who once found it difficult to hold a pencil or a chalk.

Some day, perhaps, you will be able to make beautiful pictures, too. Would you like to begin to-day and see what you can do?

How to hold your chalk when drawing

You must get two large pieces of paper, one brown and the other white. Ordinary brown parcel paper will do quite well; the best white paper for you at present is called cartridge paper. Then you must get some white and some colored chalks. If you have a paint-box, you must learn to use it, and I hope it is the kind of box that has moist colors in pans or in tubes. You must have a jar of clean water ready, and your paint-box must be quite clean, too. No one can paint with dirty colors or brushes.

If you can find a drawing-board and four drawing-pins, you can fasten your sheet of brown paper to the board at each corner; but if you have not a board, you should use a big book with a smooth cover. Put a box or another book under the end of the board; this makes the paper slant a little, and saves you from having to stoop. It is bad for your eyes and back to stoop over your work.

When everything is ready, choose something easy to draw. Suppose you

get an orange, or an apple, or an egg, and put it a little way in front of you on the table. Then take a nice thick piece of white chalk. It is very difficult to hold it properly at first, especially if you have learned how to write, because the right way to hold a chalk is quite different from the way in which we hold our pens. The fingers must not be close to the point of the chalk, but half-way down, as we see in the picture. Don't hold your chalk too tightly, and if your fingers feel stiff and ache at first, do not mind that, but try very hard to hold it right—it is very, very important.

When you can manage to hold the chalk in the proper way, you can begin to copy what you have chosen. Do not make a thin line with the point, but let the side of the chalk touch the paper, and rub it round and round till you get something like the shape you are copying. Take care that it is not too small; all your drawings must be big. It is much better that they should be too big than too little. If you hold the chalk in the right way it will be easier to rub it round and round, and it will not take so long to get the right size as it would if you held your fingers close up to the point.

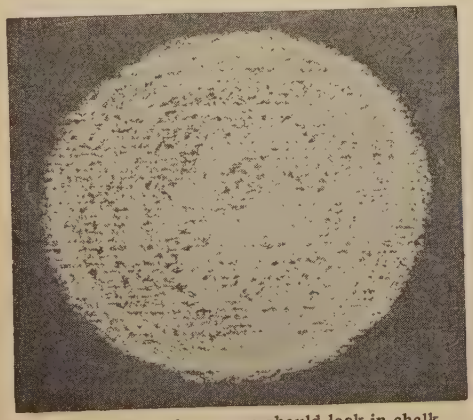
The pictures show you the right way and the wrong way to begin. If your first drawing does not look good, do not try to rub it out, but make it over and over again till you get it right. If you are drawing an orange, make it a little flat at the top and the bottom. An egg is rather long and thicker at one end than at the other. Apples are all sorts of funny shapes, not any of them quite round, and you can often see the stalks.

I have made a picture of each one to show you how they ought to look, but you must copy the real things for yourselves, and not my drawings.

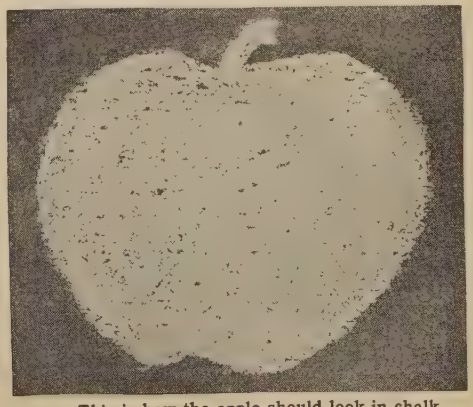
The right and wrong way to begin with chalk. Do not chalk in single lines, but rub the chalk round and round.

When you have made a good picture, you can put the brown paper away, and choose a white piece. If you are drawing an orange, try to find a piece of colored chalk exactly the right shade of yellow, and draw with it on the white paper, beginning in exactly the same way as you did before. See that you are holding the chalk properly. An apple must have green and red chalk, too, if it has a rosy cheek. You cannot draw a white egg with white chalk on white paper, because it would not show, but some eggs look brown or pink, and you can draw these if you can find chalks to match the color.

If you want to use your paint-box, remember it must be quite clean before you begin. Take a rather thick brush. Some brushes are good and some are bad. The best brush for you to use at present



This is how the orange should look in chalk



This is how the apple should look in chalk

costs only a few cents at the most. If it has any loose hairs, or if some of them are longer than others, it is a bad brush, and you had better not try to use it, as these hairs will make lines where you do not want them. A good brush will have the hairs so arranged that you will be able to draw them all smoothly together to a point after you have dipped it in the water.

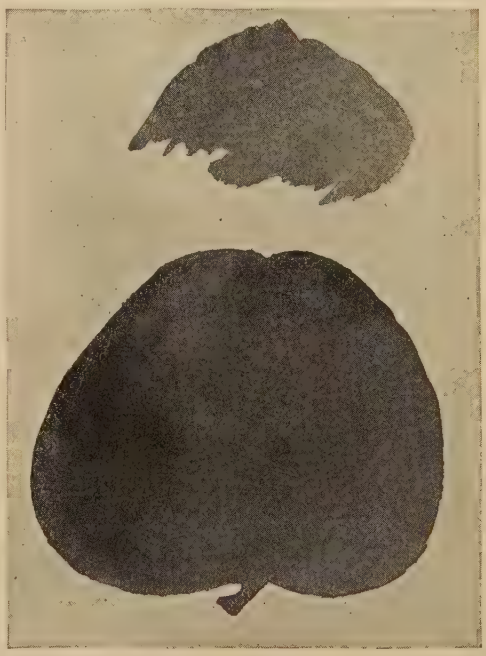
If your paint-box has hard cakes of paint, you must first put a little water in a clean saucer and rub the hard cake well in it until you have enough color mixed. If your box has moist colors in pans, you must first dip the brush in water and then in the color, and you should then put as much color as you want to use in the tin lid of the box. Tube colors must be used carefully, and the tube should be squeezed very gently at the bottom. Put out only a little color, and always put on the little cap again when you have squeezed any color out.

For the apple you must mix blue and yellow together. There are different blues and yellows in your box, and you must try which will make the green most like the color you want. Or you may take the green in your box and make it darker or lighter.

If the apple has a red cheek you must choose the proper red, and mix both colors—the green and the red—ready in separate parts of your paint-box or saucer. The orange must have bright yellow, and if the yellow in your box is too pale, mix a little red with it till you get the right shade. For the pink or brownish egg, you must take a little brown or red paint, made pale with water. Never use Chinese white or any white paint when you are painting on white paper. If your paint is too dry it will make your work look smeary, and if there is too much water in it, it will run all down the paper.

Hold your brush rather low down, and try to paint from one copy. Do not make any lines with your brush, but begin in the same way as you began with your chalk. Paint as smoothly as you can, and do not go over the same place twice, or go up and down with your brush.

It is rather difficult at first to paint anything that has two colors, like the rosy apple. I will tell you how to do it, and you can try, but do not be surprized if it does not look right the first time.



This shows an apple and how to begin to paint it

Put the green paint all over in the shape of the apple first, and wait a little while. Then take some bright red paint, with only a very little water in it, on the point of a clean brush. Before the green paint on your apple is quite dry, touch it with the point of this brush in the place where the rosy cheek is. The red paint will run into the green and look very nice if you have done it carefully.

Little Japanese girls and boys write all their letters with a paint-brush and black paint, and so it is easier for them to hold their brushes properly, because they have so much practice. If you ask someone to show you some Japanese pictures it will help you to do your own.

If you have found all these things easy to do, you can try to make a dish of fruit or to draw an egg in an egg-cup, but it is much better to do a little at a time and a little every day. It is a very good plan to see if you can remember what you have drawn, and to do it over again without looking at the thing itself; and another good plan is to test your drawing by asking your friends to guess what it is. Sometimes they may not know.

LITTLE PICTURE-STORIES IN FRENCH

YOU will not be able to learn to speak French from these lessons. There are some sounds in French which cannot be made clear on paper, and you will only be able to understand these by hearing them spoken. But these lessons will help you very much if you are learning French at school, or if there is someone at home who can help you to understand how the words should be said. The French people say E just as we say A, and say I just as we say E. But there are some sounds which are not so easy to learn as these, and it will be better to ask someone to help you when reading these little lessons than to try to learn all these difficult things yourself, however hard we might try to make them easy for you. These lessons tell us the story of a visit to France and of the visitor's doings among the French people, and the pictures help to make the language quite clear. The first line under the picture is the French. The second line gives the English word for the French word above it. But the French people do not always put their words together in the same way as we do, and the third line shows how we make up the words into our own language.

Louis

Je m'appelle Louis, et j'ai dix ans
I myself call Louis, and I have ten years,
My name is Louis, and I am ten years old

Jeanette—Jenny

Ma sœur Jeannette a huit ans
My sister Jenny has eight years
My sister Jenny is eight years old

Bébé—Baby

Mon petit frère a deux ans
My little brother has two years
My little brother is two years old

On l'appelle Bébé
One him calls Baby
He is called Baby

L'école—The school

Jeanette et moi nous allons à l'école
Jenny and me we go to the school
Jenny and I go to school
Maintenant nous sommes en vacances
Now we are in holidays
Now we have a holiday

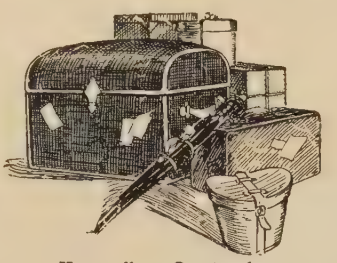
Maman—Mamma

Papa

Nous allons en France
We go in France
We are going to France
Nous allons avec papa et maman
We go with papa and mamma
We are going with papa and mamma

La bonne—The nurserymaid

Bébé va venir et la bonne aussi
Baby goes to come and the nurse also
Baby is going and nurse also



Nos malles—Our trunks

Notre bonne a fait toutes nos malles
Our nurse has made all our trunks
Our nurse has packed all our trunks
Nos jouets sont dans la grande malle
Our toys are in the large trunk
Our toys are in the large trunk

Nos jouets — Our toys

Nous avons beaucoup de jouets
We have many of toys
We have many toys
Bébé emporte son bateau à voiles
Baby carries away his boat to sails
Baby is taking his sailing boat

Le fiacre—The cab

Le fiacre est à la porte
The cab is at the door
The cab is at the door

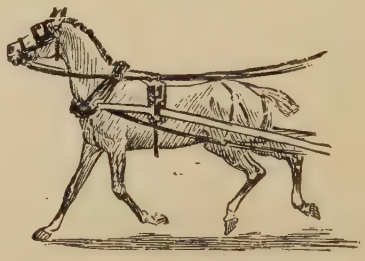
Le cocher—The driver

Le cocher met les bagages sur le fiacre
The driver puts the luggage on the cab
The driver is putting the luggage on the cab

Dans le fiacre—In the cab

Nous sommes six dans le fiacre
We are six in the cab
There are six of us in the cab

1	**2**	**3**
Un	deux	trois
One	*two*	*three*
4	**5**	**6**
quatre	cinq	six
four	*five*	*six*



Le cheval—The horse

Le cheval marche très bien
The horse marches very well
The horse goes very well

Nous aimons aller en fiacre
We like to go in cab
We like riding in a cab

La gare—The station

Nous arriverons bientôt à la gare
We shall arrive soon at the station
We shall soon arrive at the station

OUR NEXT SCHOOL LESSONS BEGIN ON PAGE 452.

THE HISTORY OF THE UNITED STATES

IN an earlier part of our book, you read of the voyages of Christopher Columbus, who is generally called the discoverer of America. That is true, for though America had been discovered before, the knowledge had been lost, and only recently have we learned the story of voyages made nearly five hundred years before Columbus, in his three little ships, sailed into the unknown sea. It was just as wonderful a thing as if it had never been done before, for we are sure that Columbus never heard of the earlier voyages. After Columbus came many other explorers, Spanish, French, English, and Dutch, and we shall read of them and their discoveries in the following pages.

EXPLORERS AND WHAT THEY FOUND

CONTINUED FROM 21

JUST before the year 1000, the Norsemen, or Northmen, as the inhabitants of Norway, Sweden and Denmark were called, were the most skilful and daring sailors of the world. Years before they had conquered a part of Russia and of France, had sailed into the harbor of Constantinople, and at the time of which we speak were about to conquer England. These strong, blue-eyed, yellow or red-haired men wearing on their helmets the wings of birds or the horns of beasts drove their dragon boats into almost every harbor in Europe, and the people in the churches prayed to be delivered from the fury of the Northmen.

LEIF ERICKSON, THE MAN WHO DISCOVERED AMERICA

The old manuscripts which have been found tell of the discovery of Greenland in the year 876 or 877 and of the founding of a colony there in 985 or 986 by Eric the Red, who went over from Iceland. This colony lasted more than 400 years, and the ruins may be seen to-day. Stories of an unknown land to the west came to them and in the year 1000, Leif, the son of Eric the Red, with thirty-five men sailed to find it. The journey was not long as you will see if you look at a map of the northern part of the world. Another account says that he was on his way to Greenland to carry Christianity there, but was blown out of his way. The stories do not agree but we shall try to make them clear.

One story says that Leif visited an island, probably Newfoundland, which he called Helluland or Flatstone Land. Others say that a later explorer gave this name to Labrador. Leif is next said to have visited Nova Scotia, which he called Markland, or Woodland, though perhaps he meant Newfoundland. At any rate he finally landed somewhere on the coast of Massachusetts, or Nova Scotia, which he called Vinland, because there were so many grapes to be seen. He spent the winter there, loaded the vessel with timber, and returned to Greenland to tell his story. Several other voyages were made to get timber, which was scarce in Greenland.

A rich man named Thorfinn Karlsefni, who had married Leif's sister, with three ships and one hundred and sixty men founded a colony somewhere on the American coast soon after, and here his son Snorro was born, the first white child born in America. From this boy some of the most distinguished men in Iceland, Norway and Denmark were descended. The Indians, whom they called "skraelings," or inferior men, made trouble, however, and after three years the colony was given up. Just where this settlement was we do not

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know, for though men have searched for signs of it, they have not been found. A few more voyages were made to get timber, but as there was no printing in those days, very few men knew about the land and the story was forgotten.

THE ENGLISH ALSO TRIED TO FIND A NEW WAY TO ASIA

We learned in another place that Columbus did not know that he had discovered a new land, but died thinking he had reached Asia. Now Henry VII of England was one of the kings who had refused to help Columbus to make his voyage. When the news came that Columbus had succeeded, King Henry was very much vexed that he had not gained the honor for himself and for England. So when a sea-captain named John Cabot, who was also born in the city of Genoa, asked permission in 1496 to make a voyage for England, it was granted at once. Cabot sailed the next year in a tiny boat with a crew of only eighteen men, and landed somewhere on the coast of Labrador or Cape Breton Island, June 24, 1497. The king was pleased, but he was a miser, and so gave Cabot only ten pounds as a reward.

The next year he made another voyage and sailed along the coast of North America, perhaps down to Chesapeake Bay, but found no gold, no precious stones, no silks and no ivory. There seemed to be little profit in such voyages and therefore the English paid no more attention to the matter for a long time. Later they claimed all of North America because they said that Cabot had been the first European to see the continent, for the voyages of the Northmen had been forgotten long before.

HOW AMERICA GOT ITS PRESENT NAME

When Columbus made his first voyage, two of his three little ships were commanded by two brothers named Pinzon. One of these, whose first name was Vincent, is said to have sailed again in 1497 and to have gone around the West Indies. He then sailed up the Atlantic coast, probably as far as Chesapeake Bay, and brought back a load of slaves that he captured on one of the Bermuda Islands. With him sailed Americus Vespucius, who told in a letter to one of his friends the wonderful things that he saw. Both Pinzon and Vespucius made other voyages, but Vespucius entered the service of Portugal and said that he explored the coast of Brazil in 1501, and claimed it for that country. Then he sailed southward until he reached the island of South Georgia, further south than any man had ever been before. Here the cold and floating ice drove him back.

When he went back to Europe he wrote a little pamphlet saying that these lands which he had seen were not a part of Asia but were a new world. This made a great noise in Europe and finally a professor in a little German college said that this "fourth part" of the world which Americus Vespucius spoke of ought to be called America in his honor. People before knew of Europe, Asia and Africa. So they called the new world the fourth part. Everybody agreed and soon the name was seen on all the maps. First the name America was given only to Brazil, then to South America, and then to all the new world.

AN OLD MAN WHO WISHED TO BE YOUNG AGAIN

A soldier of Spain named Ponce de Leon was made governor of Porto Rico. Here he founded the city of San Juan in 1511, which is the first town founded on what is now American territory. He was old and wounds which he had received in his wars pained him all the time. The natives told him that on an island not far away was a wonderful fountain of youth. Any one who drank of the waters would be made young and strong again, no matter how old and sick he was. So he got permission from the King of Spain to hunt for this wonderful spring and sailed away.

On Easter Day, in 1512 or 1513, he reached land which he called Florida, which means flowery. He searched everywhere for the magic fountain, drinking from every spring he found, but he remained old and his wounds still pained him. Afterward he returned to Florida, in 1521, to plant a colony of which he should be governor. But an Indian shot him in the thigh with a poisoned arrow and the heart-broken old man returned to Cuba to die.

The same year that Ponce de Leon found Florida, another Spaniard, named Balboa, landed on the Isthmus of

THE NORSEMEN AND THEIR SHIPS

Here we see the dragon ships driven by sail and oars in which the Norsemen dared the waves. In such a ship Leif, the son of Eric, crossed the Atlantic more than 900 years ago when he came to America. Some had as many as thirty-two oars, each pulled by a strong man, who could also fight when necessary. Not very long ago one of these old ships was dug up, and is now in a museum.

The Norsemen were as brave on land as on sea. They did not fear death, for they thought that brave warriors would be taken to Valhalla, where they might fight and hunt and feast for ages. Every night wounds received during the day would heal, and they would be ready for fresh adventures.

Panama, or Darien, as it used to be called, not very far from where the great canal has been dug, crossed it, and saw the great Pacific Ocean. Wading into it, we are told, carrying the flag of Spain in one hand and a sword in the other, he declared the ocean and all the lands which its waters touched belonged to Spain forever.

CORTES, WHO CONQUERED MEXICO AND FOUND MUCH GOLD

But the most important of the Spanish explorers was Hernando Cortes, a soldier, who made a large fortune in Cuba. In 1519 he led a force to conquer Mexico, and built the town of Vera Cruz. The inhabitants of Mexico that he saw were Indians called Aztecs who were partly civilized. They had tools and weapons of bronze, but they did not know the use of iron. They built great cities, and had mines of gold and silver, but they thought that the ships were great white birds that had come down from the sky and the white-skinned Spaniards were gods who had come to take the country. If you will read General Lew Wallace's book called, "The Fair God" you can find more about what they thought and what happened to them.

The ruler of the country was called Montezuma. He sent presents to Cortes but said that the road to his capital was so bad that Cortes ought not to try to come to visit him. But Cortes destroyed the ships so that his men could not get back and marched into the country. Though the Indians feared him, they tried to fight him and one terrible battle lasted two days. There were fewer than five hundred white men in Cortes' army and there were many thousand natives, but the cannon, the guns and the horses were too much for the Indians.

THE WHITE MEN CONQUER MEXICO AT LAST

Then they attacked at night, thinking that if the Spaniards were children of the sun, they would have no power when the sun had gone away. But they found that the Spaniards could fight as well by night as by day, and Cortes marched on until he reached the City of Mexico. Montezuma sent four cartloads of gold to Cortes and begged him to go away. Soon he captured Montezuma, but the Aztecs attacked the Spaniards while Cortes was away, and when Montezuma attempted to make peace, wounded him so that he died. Then Cortes conquered the country and sent many expeditions into what is now the United States. We shall hear more of them later on in our book.

HERNANDO DE SOTO AND THE MISSISSIPPI RIVER

Another famous explorer was Hernando de Soto, who had helped to conquer Peru. When he returned to Spain the king made him governor of Cuba and gave permission to conquer Florida. He landed in 1539 with five hundred and seventy men and two hundred and twenty-three horses and marched into the country. De Soto treated the Indians very cruelly and made many of them march with him wearing iron chains around their necks. There were no roads, and as the Spaniards were crossing streams or swamps, the Indians would attack them. The Spaniards were not good hunters, and often they had little meat.

To get rid of them the Indians said that there was much gold further north, in what is now Georgia, but De Soto could not find it and the Indians fought him all the time. In one great battle they killed a hundred and seventy of his men. He wandered over land which is now several states but found no gold. His men begged him to turn back but he refused and after much toil and trouble reached the Mississippi River near where the city of Memphis now stands, in 1541. They thought they were the first white men to see this great stream, but we know now that another Spaniard, named Pineda, had sailed into it from the Gulf of Mexico in 1519, and that another explorer had crossed it in 1528. De Soto and his men were very much amazed at its size. Finally they made boats and crossed it. They wandered along the west bank but still could find no gold. At last the brave but cruel commander died of a fever on the 21st day of May, 1542. His companions feared to let the Indians know that he was dead, and so one night they buried him in the great river and told the Indians that he had gone to visit in the sky for a time. They then built rude boats, floated down stream, and

FAMOUS EXPLORERS OF AMERICA

CORTES

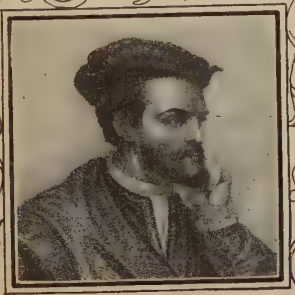
BALBOA

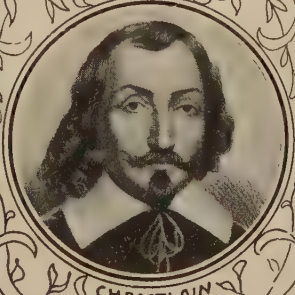
DE SOTO

DRAKE

RALEIGH

HUDSON


CARTIER


CHAMPLAIN

LA SALLE

Three of these explorers are Spanish three are English and three are French. Cortes conquered Mexico, Balboa discovered the Pacific Ocean, and De Soto reached the Mississippi River. Sir Francis Drake and Sir Walter Raleigh were great favorites of Queen Elizabeth. Henry Hudson, though an Englishman, was in the Dutch service when he sailed into the Hudson River. Cartier, Champlain and La Salle explored the St. Lawrence and the Mississippi, ever hoping to plant the flag of France.

some of them at last reached the Spanish settlement in Mexico.

Other Spanish Explorers; the Oldest Town in the United States

As yet there was not a single permanent settlement in what is now the United States though Spaniards had explored all of the southern part of the country. Coronado, in 1540, had gone north from Mexico to find several rich cities that he had heard of. He did not find any cities except Indian villages, but in the country which he called Quivira (possibly Kansas) he told of seeing strange "crook-backed cows." These, as you can guess, were our American buffalo. Finally Menendez, in 1565, founded the town of St. Augustine in Florida, which is therefore the oldest town in the United States. Another Spanish party founded Santa Fé in New Mexico about 1605, or a little earlier, the second oldest town in our country.

The French Found Colonies, but Spain Destroys Them

Now we shall leave the Spaniards for a time and see what other nations did. Though it was found that the new country was not Asia, it was believed for a long time that it was narrow and that there was a "northwest passage" through the land by which Asia might be reached. The French king sent Verrazano, an Italian sailor, to search for this passage in 1524. He reached the coast probably about North Carolina, and sailed further north than Rhode Island. It is almost certain that he was the first white man to sail into New York harbor and to see the Hudson River, but he attempted no settlement. A statue of him stands in a little park called the Battery which is at the very point of Manhattan Island. The French at this time were more interested in capturing Spanish ships loaded with gold and silver which they had forced the helpless Indians to get for them, than in founding colonies. You may read of Jacques Cartier in the Book of Canada.

The Spanish and the French Come to Blows in Florida

There was also about this time civil war in France on account of differences in religion. Those who adopted the reformed faith were called Huguenots and there was bitter war between them and those who held the old faith. Some leaders of the Huguenots tried to found a colony in the New World where they would not be disturbed because of religion. They began with thirty men at Port Royal, in what is now South Carolina, in 1562, but they nearly starved and left.

Two years later a fort called Carolina was built in Florida. At first food was very scarce and they were forced to eat grass, roots and even snakes. Many more men, women, and children came out and leaders hoped that the settlement was strong enough to grow. But the Spaniards claimed the country, and Menendez, who founded St. Augustine, of which you have read above, surprised the French fort and killed every one he found, about seven hundred in all. Menendez thought that he was right in killing these men and breaking up the settlement. They were enemies to his country and to his religion.

A few of the settlers escaped and, after suffering many hardships, reached France, and told their story. The King of France demanded that Philip II punish Menendez for his act, but the Spaniard said that the settlement was where it had no right to be, as the country belonged to Spain. France was afraid to attempt to punish the Spanish leader, and did not try to make any more settlements in Florida.

There is a story, which may be true, that a French gentleman, Dominique de Gourgues, determined to get revenge for his countrymen. It is said that he fitted out three ships in 1657. With them he sailed and captured the Spanish garrison which had been left in Fort Carolina and killed every one of them.

How Champlain Made a Mistake Which Lost America

The most important of all the French explorers was Samuel de Champlain. He was a man that every one of you would have liked. He was gentle and tender but at the same time was as brave as a lion. He had been a good soldier, a fine sailor, and now he made up his mind to help France to gain a part of the New World. He made two voyages in order to get knowledge and then in 1608 led a party and founded what is now the great city of

THE FIRST SIGHT OF WHITE MEN

When the Indians first saw the whites they were generally friendly. Here we see one offering a fish, but his less brave companions remain in the edge of the forest, ready to fly if the whites offer harm.

When Henry Hudson in the Half Moon sailed up the great river now called by his name the Indians in their canoes visited him, above Manhattan Island, but the noise of firearms frightened them very much.

Quebec in Canada. Like all the other settlements this one suffered great hardships at first and before the first winter was over twenty-one of twenty-eight men died. Others came out in the spring and Champlain decided to explore the country.

Here he made a great mistake which many years afterward caused the French to lose all the land they had in America. He had heard of a great lake in the south and wished to see it. Some Indians who lived near him were going to fight the Indians who lived near the lake, and Champlain and two companies joined them. Finally they reached the great lake, which is now called Lake Champlain. They paddled on this until they met a large band of Indians near Ticonderoga. When the battle began the Indians with Champlain would have been defeated if he had not fired his gun and killed some of the bravest war chiefs of the other side. The strange Indians had never seen a white man or heard a gun. Frightened at the white men's power, they ran away and many were killed.

THE INDIANS WHO NEVER FORGOT A DISGRACE

These Indians were members of the Mohawk tribe, which you were told in our first chapter was one of the Five Nations. They told the other tribes about the disgrace which had come to them because of the French and all the Five Nations swore undying hatred toward that nation. Many years afterward, when France and England were at war, the Five Nations, now become the Six Nations, would not allow the French to come down the Hudson to capture New York and fought fiercely against them though the other Indians favored them. Champlain also explored the country toward the north and helped to build up the fur trade, which later brought in so much money to the French.

Father Marquette was a Jesuit missionary who came over to convert the Indians. He heard of a great river in the west and joined Louis Joliet, who was sent to find it by the governor of Canada. They started in 1673, crossed Lake Michigan, paddled up the Fox River, carried their canoes to the Wisconsin River and floated down it to the Mississippi. Once they landed in the territory of the Illinois Indians, where they were given a great feast.

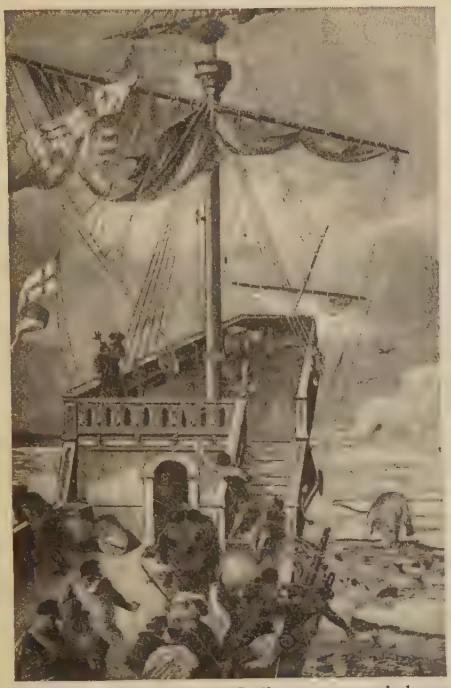
THE INDIAN CHIEF MAKES A FEAST FOR HIS GUESTS

There were four courses in this feast. First was mush made from Indian corn, which the chief fed to the two explorers from the same spoon made of buffalo horn. Next the chief took the bones out of a fish and with his fingers fed them choice morsels. The next course was a fine fat dog and the last was buffalo meat. After the feast they continued their journey. At last they reached the mouth of the Arkansas River. By this time they found that the Indians were becoming unfriendly and they turned back. But they had found that this great river was the same that flowed into the Gulf of Mexico. On the way back Father Marquette became sick and had to stop for the winter. The next year he died, but before his death wrote an account of his travels. Joliet reached Montreal but lost his maps on the way.

There is one more French explorer of whom we must speak. This was Robert Cavelier, who is generally called La Salle. He seems to have been one of the bravest men who ever lived. After he determined to explore the Mississippi to its mouth, luck seemed to be against him. A ship called the Griffon, which he built in the Niagara River, was lost with valuable furs. The garrison of a fort he built mutinied and tried to kill him, but he beat them and sent them back to be punished. His best friend, Tonty, who was waiting for him in an Indian village, was almost captured by other Indians and was forced to wander in the woods. A ship bringing to him money from France was lost.

None of these misfortunes had any effect upon his spirit. When he found that he could not get a vessel to sail down the river, he said that he would go in canoes. These he and his companions carried across from the Chicago River to the Illinois River. They floated down this to the Mississippi and then started on their long journey to the Gulf of Mexico in February, 1682. The party consisted of twenty-three Frenchmen, eighteen Indian men, ten squaws and three children.

MORE EXPLORERS AND DISCOVERERS



John Cabot, though an Italian, commanded an English ship, and in 1497 reached the coast of North America, probably on the coast of Labrador, and so gave England a claim to the continent.

Verrazano, another Italian, but commanding a French ship, sailed into New York Bay in 1524, eighty-five years before Hudson. This fine statue now stands in Battery Park, New York City.

You have read how De Soto, vainly searching for gold, marched over what is now Florida, Georgia, Alabama, Mississippi, and other states, and how at last he reached the Mississippi River, in 1542. He crossed it, but found a grave under its waters, so that the Indians might not know of his death.

A BRAVE FRENCHMAN FLOATS DOWN THE MISSISSIPPI

They paddled on, passed the point where Marquette and Joliet turned back, and finally reached the Gulf of Mexico. At the mouth of the river, on the 9th of April, 1682, La Salle erected a stone declaring that all the country through which the river ran was the property of France, and named it Louisiana in honor of the French king. The French claimed that this exploration of the river gave them the right to all the country drained by that river, just as they said that the exploration of the St. Lawrence gave them the right to all the country from which water flowed into that stream.

But La Salle knew that they could not keep the country unless they had settlers in it. So he planned to place a strong colony at the mouth of the Mississippi River and went to France to get men and supplies. The king listened to his wonderful story and was pleased. In 1684 he came back with two hundred and eighty persons in four ships. But his pilot could not find the mouth of the river. Where the Mississippi flows into the Gulf it is very wide and many other rivers flow into the Gulf. There are also many bays in the shore which look like the mouths of rivers. They sailed on and finally landed in Texas, four hundred miles west of the Mississippi. Here they built Fort St. Louis while La Salle hunted in vain for the great river.

His people did not know how to take care of themselves in the wilderness and many died. Food became scarce and La Salle, with a few companions, started by land toward Canada to get help for the others. Some of his party, however, were bad men whom he had punished for their misdeeds and they determined to put an end to him. So two of them went on before and hid in the bushes. When La Salle passed they shot him in the back. He was only forty-four years old, but he had had more adventures than a hundred ordinary men. He is remembered as one of the bravest men who helped to make America known.

HOW FRANCIS DRAKE MADE THE SPANIARDS FEAR TO CROSS THE OCEAN

Now let us see what the English did. You remember that John Cabot very early made two voyages for Henry VII, but that the English did not follow them up. Still the hope of finding a northwest passage to Asia did not die out entirely. After the great Queen Elizabeth, about whom you may read in another part of our book, came to the throne of England, that country and Spain were not friendly. One of the best ways to hurt Spain was to capture the ships bringing treasure from Mexico or South America. With light ships, but with good cannon, the Englishmen sailed about, looking for the heavy, clumsy treasure ships which were called galleons.

One of the most famous of these privateers, as the English called them, or pirates, as the Spanish called them, was Francis Drake. He was the oldest of the twelve sons of a poor English clergyman. While a little boy he loved to sit on the shore to watch the ships or to go down into the harbor and talk to the sailors of the strange lands they had seen. He went to sea when still a boy and when he was eighteen was the owner and captain of a ship. His hate for Spain was always strong and he sailed about looking for Spanish ships wherever he could, and would even land men to attack Spanish settlements.

FRANCIS DRAKE THE TERROR OF SPAIN

On one of his voyages he reached the Isthmus of Panama. While there he climbed to the top of a tall tree and saw the Pacific Ocean. He knew that the Spanish ships were on that ocean and declared that English ships should sail there too. When he went back to England some wealthy friends provided five ships for him. The little fleet sailed in November, 1577, and after being fifty-four days out of sight of land reached the coast of Brazil. Then they sailed southward along the coast, but the winds and the fogs held them back and two of the ships were lost. Not until August, 1578, could they enter the Straits of Magellan. Here he lost two more ships, but finally his own ship, the Golden Hind, got through in spite of the wind and the tide.

He was very lucky in finding Spanish silver. Once he saw a Spaniard and an Indian driving eight llamas along

the shore. He captured them and found that each llama had a load of a hundred pounds of silver. Drake even dared to sail into the harbors and captured Spanish ships at anchor. He captured also several Spanish ships on the way home from China with silks and china and other costly things, and altogether did great harm to Spanish trade.

The Spaniards were so angry that he thought that they would probably have warships placed to capture him if he tried to go back by the way he came. So he decided to sail across the Pacific and go home that way. But first he sailed north as far as Oregon, but stopped where San Francisco now stands. Here he had a great talk with the Indians, who thought the white men were gods. He called the country New Albion, which means New England, and set up a post with Queen Elizabeth's name on it to claim all the territory for her.

DRAKE ALSO SAILS AROUND THE WORLD

Then he sailed across the Pacific and for sixty-eight days saw no land. He stopped at the Philippines, which the United States took from Spain not very long ago, to trade with the natives and to get provisions, and once his ship ran aground in shallow water. Finally he got her off, sailed around Africa, and finally reached home November 3, 1580, nearly three years after he started.

OTHER ENGLISH EXPLORERS TRY TO FOUND COLONIES

Other famous English explorers of America were Martin Frobisher and John Davis, who tried to find the northwest passage to the north of America, and Sir Humphrey Gilbert, who was lost at sea in 1583 while trying to found a colony in Newfoundland. He and his half-brother, Sir Walter Raleigh, had decided that in the end there would be more profit in making permanent settlements than in searches for gold, silver and precious stones.

In another part of our book you are told much more about the life of Sir Walter Raleigh and we shall not say much more about him here. He never came to North America himself, but he helped his brother, Sir Humphrey Gilbert, when he tried to plant the colony in Newfoundland. The year after his brother's death, Queen Elizabeth gave him permission to settle any lands not occupied by a Christian nation that he could discover in six years. He sent out an exploring expedition which reached what is now the coast of North Carolina and brought back such a wonderful story that he made two attempts to found a colony there on Roanoke Island. He gave the name of Virginia to the whole coast in honor of Queen Elizabeth, the Virgin Queen. We shall tell you how both failed and how one colony disappeared, so that it is not known to this day what became of it. Look in the index to the whole book for the title "*Lost Colony of Roanoke*" and you will learn about it.

HENRY HUDSON, IN THE HALF MOON, COMES TO A GREAT RIVER

The Dutch at this time were great traders and sent many ships to India and the islands of the South Seas. Still hoping to find a shorter way to that region, a trading company in Amsterdam, called the Dutch East India Company, sent Henry Hudson, who was born in England, but was then the captain of a Dutch ship, to try to find the way. In his little ship, called the Half Moon, he sailed across the Atlantic in 1609 and reached the coast near Chesapeake Bay. Then he sailed northward, looking closely for the opening into the Pacific, and September 3, 1609, thought that he had found it, when he anchored in what is now New York Bay. He thought that the great river which now bears his name reached all the way across America, for it was salt because of the rise of the tides.

On the 12th of September he started up the river, seeing many Indians, who were quite willing to trade furs for beads and hatchets. He kept on about 150 miles up the river until he reached the place where Albany now stands. There he found that the water was growing shallow and that it was no longer salt. Then he sent a small boat further, but his men reported that the water grew shallower and shallower and was quite fresh. Disappointed at not finding the passage, he turned and sailed down stream. He treated the Indians well and they liked him and gave him feasts. They thought he was the Great Spirit, who had come to visit them.

THE VAIN SEARCH FOR A SHORT WAY TO ASIA

You will read in another place about the later voyages of this good captain and about his sad end, but his name will be always remembered by the great river and the great bay in Canada which he discovered and which bear his name to this day. In 1909, three hundred years after he first saw Manhattan Island, the citizens of New York had a great celebration in his honor.

Because men had found out that America was very narrow at Panama, and not very wide at other parts of Central America, they thought that other parts must be narrow also. They felt sure that somewhere there must be a passageway by which they could reach Asia. America had been a great disappointment. No nation except Spain seemed to be able to find any gold or silver, and the New World kept them from reaching Asia. For more than a hundred years after the discovery there had been few attempts to found colonies. Men tried to find treasure or this western passage to Asia. It was not until the Panama Canal was dug in our own time that the passage to Asia was opened through the Americas. Perhaps another may be opened before many more years.

WHAT EACH NATION HAD DONE.

The Spaniards had conquered Mexico and had explored a good deal of territory beyond the Mississippi by means of parties sent out from Mexico. They had explored much of the southern part of the country east of the Mississippi and had also made settlements in Florida. They claimed almost all of the southern part of the United States though they had made few settlements.

The French had explored the St. Lawrence River and the Great Lakes and the Mississippi River besides. They claimed as their own all the country from which water ran into any of these. They had several settlements on the St. Lawrence and one on the Gulf of Mexico.

The English claimed the whole of North America extending to the Pacific Ocean because it had been discovered by John Cabot, but did not have a single settlement until 1607, when Jamestown was founded, though they had tried and failed.

The Dutch claimed the Hudson River and the country down to the Delaware River (which they called the South River) by right of discovery, and at once sent trading ships to get furs. Soon a little trading post grew up on Manhattan Island, which was later to grow into the town of New Amsterdam, and then into the great city of New York.

You will find later that Sweden also tried to plant a colony in America, but that nation had little share in exploring the new country, though under two great rulers it increased very much in power and influence.

THE POPE DIVIDES THE WORLD BETWEEN SPAIN AND PORTUGAL

You have already read in another part of our book that Portugal was once a powerful country with many ships and brave sailors, and you have wondered, perhaps, why that country had no share in the work. The reason for this is very easy to tell, and shows also how much power the Pope and the Church had in those days.

When Columbus returned to Spain, King Ferdinand wrote of the discoveries to the Pope, and asked him to give him the right to these heathen lands. The Pope answered by drawing a line down the Atlantic Ocean about three hundred miles west of the Azores Islands, and giving to Spain all the new heathen lands west of the line, and allowing Portugal the lands to the east.

Portugal was not satisfied, and had the line moved eight hundred miles further west, but still the line did not touch North America, though it came very close to Newfoundland, and two brothers named Cortereal explored the region hoping that Portugal could claim it. A part of South America was east of the line, and in 1500 a sailor named Cabral touched the coast of what is now Brazil, and Portugal planted a colony there.

As you have seen, much of the land was claimed by two or even three nations, and we shall see later that fierce wars grew out of these claims. In our next chapter we shall learn how people went to work to build homes for themselves in the new land across the sea.

CONTINUED ON PAGE 399.

WHAT THIS STORY TELLS US

THIS story tells us still more of the way in which a plant lives upon air. None of us could live without air, but all that we do is to breathe air. The great secret of the plant is that it can eat air and live upon it. The green stuff in the plant is made by the sunlight; it is made where the sunlight strikes the leaf; and when it is made the green stuff uses the sunlight to do a remarkable thing. It takes the carbonic acid gas that is in the air and splits it up into two things—carbon and oxygen. The carbonic acid gas is poison, but the plant splits it up and makes it into food, not only for itself, but for us. That is what a plant does with the sunlight, and it is, perhaps, the most perfect use of power in the world.

HOW THE PLANT LIVES ON AIR

CONTINUED FROM P. 246

IF we go back to what we said about the plant's breathing, we shall remember that the plant is surrounded by air. We have seen that this air contains oxygen, which is a gas, but it also contains many other gases, for the air we breathe is nothing else than a mixture of gases. Now plants, as well as animals, breathe air, but all green plants do also what no animal can do—they eat air. The gas in the air which plants eat, or feed upon, is, curiously enough, the same gas as that which the plant gives out whilst breathing—carbonic acid gas. We have already seen that this carbon dioxide is made up of two parts—carbon and oxygen. Carbon is important not merely because it makes diamonds and coal and lead pencils, but because it is one of the things that are always necessary as part of the food of living creatures, animal or vegetable.

All air contains a small quantity of carbon dioxide, which is partly made up of carbon. So far as animals are concerned, this gas is a poison. If there is any more than only a very little in the air, we die, so far are we from being able to make any kind of use of it. One of the difficulties of our life in houses is to keep the air fresh—that is to say, to prevent it from having too much carbon dioxide in it.

But this stuff, which is poison for us and for all animals, is food for the plant; and, if it were not food for the plant, there would be no risk of it poisoning animals, for there would be no animals for it to poison. That is the way in which living things depend upon each other.

Now, the great question is: How does the plant manage to make food for itself out of this carbon dioxide? The gas itself is of no use to the plant, any more than it is to us. We have already seen that the plant gets rid of it when it breathes, just as we do, and to take it back again as it is would doubtless kill the plant, just as we should be killed if we went on breathing our own breath—or other people's—over and over again.

The only way in which the plant can get food out of the carbon dioxide is to split it up into the two things of which it is made—carbon and oxygen, to keep the carbon, which is good food, and to give back the oxygen to the air. This, you see, is exactly the opposite of what the plant does when it is breathing. Now, the plant only does this in daylight, because it depends upon the sun for its power to do it; but though it only does this in daylight, whilst it breathes all the time, day and night, yet it breathes so slowly and it does this so quickly, when it does do it, that in the long run it takes from the air far more carbon than it gives to the air, and builds up this carbon into its own body. That is why it grows and how it grows; and a plant

goes on growing all its life, whilst little boys and girls, as we all know, only go on growing for a few years, and then never grow any more.

That is really one of the greatest differences in the world between animals and plants, and it entirely depends upon this great power that the plant has of taking carbon dioxide from the air, splitting it up into its carbon and oxygen, giving back the oxygen to the air, and building up the carbon into its own body. Every green plant does this all its life for so much of every twenty-four hours as there is sufficient light in the sky. As it is building the carbon up into its own body, it fixes the carbon on to other kinds of stuff in such a way as to make things which animals, including ourselves, can eat.

THE MOST IMPORTANT THING WE KNOW ABOUT PLANTS

All animals, like all plants, require carbon, but if we were left with nothing but the carbon dioxide in air to get our carbon from, in a coal-mine, with tons of carbon all round us and tons of lead pencils and millions of pounds worth of diamonds, we should die of starvation in a day or two. There would be enough carbon around us to keep I do not know how many thousands of animals alive, if only it could be used. But we should be like the foolish king in the story who wished everything turned into gold, and then found that though everything was gold and worth a great deal it was worth nothing to him, for you cannot live by eating and drinking gold. Just in the same way animals—which must have carbon or die—cannot live on diamonds or even the carbon dioxide in the air, and the most important fact about green plants is that they can take the carbon from the carbon dioxide in the air, can live on it, and turn it into their own bodies, and then give those bodies as the food without which the whole animal world, including even ourselves, must surely die.

THE WONDERFUL WORK THAT THE GREEN STUFF DOES

What about the green stuff, then? What does it do? Well, the answer is that without it none of this could be done. Let us see what it is exactly that happens. Carbon dioxide, as we have seen, is made up of carbon and oxygen, and these two things are joined very powerfully together. Unless you are a green plant, it is one of the most difficult things in the world to separate the carbon and oxygen of carbon dioxide from each other. They are so powerfully joined that it needs very great power, used in just the right way and at just the right moment, to separate them, and then, if you are not very careful and clever, they will join together again before you know where you are. All this is supposing that you are not a green plant. It is only quite lately, even since little boys and girls were born, that men have learnt, with great difficulty and expense, and long preparation and a great deal of danger, to separate carbon and oxygen from each other when once they have joined to form carbon dioxide. But if you are a green leaf it is quite different.

The green stuff in the green leaf has no power of itself, and you understand that it is power which is wanted in order to separate things which are powerfully joined together. The more tightly a nail is stuck in a wall the harder you must pull to get it out.

HOW THE PLANT USES THE STRONGEST POWER IN THE WORLD

Now, there is no power in the world stronger than the power of sunlight. The plant knows this, and men know it too. So, when they try to separate carbon from oxygen, men naturally use the power of sunlight in order to overcome the power with which the carbon and oxygen are holding on to each other; and, of course, men can help themselves to sunlight just as well as the leaf can—and much better. They can store it up and turn it into other shapes, and then let it loose, so to speak, in far greater power than the leaf ever has any chance of using—that is to say, men can use far more sunlight at a given moment than the leaf ever gets a chance of using at a given moment. Between two ticks of a watch the leaf only gets a certain small amount of sunlight, even on the brighest day in the summer in the hottest part of the world, where the sun is shining straight down upon it. Now, men can store up sunlight in hundreds of different ways, so that between two

ticks of a watch they can use, if they like, millions of times more than the leaf would receive in the whole of its lifetime.

THE DIFFERENCE BETWEEN HAVING POWER AND USING POWER PROPERLY

But it is not enough to have plenty of power—you must know how to use it, or how to apply it, or how to direct it. If the power in a steam-engine is properly used, it will draw a train or take a great boat across the ocean; but if it is not properly applied or directed, it will go its own way and may kill thousands of people. This difference between having power and using it properly is true of everything—green leaves and steam-engines and everything else—and a whole library of books might be written on just this one little truth. It is really one of the greatest truths in the whole world.

Money is power, and great things may be done with it. With enough money a man might save millions of lives every year; but we all know that it is not enough to have money in order to profit by it. You must know how to use it, how to apply it, how to direct it. Many people nowadays have plenty of money, and all they do with it is to destroy themselves and destroy or make miserable thousands of other people. Then, again, to be clever is power; but that power is worth nothing unless it is properly used, applied, or directed. One of the cleverest men who ever lived was called Napoleon. His cleverness was so powerful that if it had been properly applied it might have made the world into a better and happier place for all ages to come; but he did not know how to use his cleverness or power, and so he caused the death of at least eight million men, women, and children, destroyed the happiness of countless millions more, and died wretched and in prison. That is the difference between having power and knowing how to use it.

Now let us go back to the green leaf we were talking about. The sunlight which pours down upon it is power. Clever men all gathered together, after making long preparations, can help themselves to far more power than the green leaf can get, but they cannot apply it, and so they can scarcely do what the green leaf does. The green stuff in the green leaf makes it able to apply all the sunlight it gets to the business in hand, which is to split up the carbonic dioxide of the air into its carbon and oxygen, and to keep the carbon for the use of the plant. This is done without any noise, without any fuss, without any machinery, without great heat, without any waste at all, and without any wear and tear of anything.

HOW THE LEAVES DRINK IN THE SUNLIGHT

The leaves of a tree are flat and thin, so that they can drink in the sunshine. The white leaves are leaves on which the sun is shining.

In the whole wonderful world I know of nothing to beat this for the perfect way in which power is put to use. It is not merely the best, it is perfect, and without it this glorious earth, with all its wonders of life—trees and fish and birds and men — would be as dead as a pebble. So if you are a little boy you might do worse, when next you run out into the garden, than take off your hat to the sun above you and the grass upon which you tread.

WHY A BOY MIGHT DO WORSE THAN TAKE OFF HIS HAT TO THE SUN

Though you are, beyond words, more wonderful and greater than either of them, and though they are so wonderful themselves just because they make little boys possible, yet who will dare to deny that even little boys owe them wonder and awe and love?

THE NEXT PART OF THIS IS ON PAGE 375.

THE SONS OF THE DESERT AND THEIR ARAB STEEDS

The horse is one of the most faithful friends of man. Here we see a picture, which was painted by the German artist, Adolf Schreyer, showing an Arab chieftain mounted on a dapple-gray horse leading his troop into battle. The Arab's devotion to his horse is famous, and the horse returns his master's love with almost human intelligence. Cases have been known where Arabian horses have stood over their wounded masters in the thick of battle, thus saving them from being trampled to death under foot. Some fine specimens of the Arab horse have been taken to Europe, and some have been brought to America.

WHAT THIS STORY TELLS US

THERE is an animal friend of every man in every land. Many animals are man's enemies, and in some parts of the world men live in great danger from the lion, the tiger, the wolf, and other wild beasts. Once upon a time the animals lived in the world alone: there were no men and women and children at all. Then came man, and by his wonderful mind man conquered the animal world. With his hands man has made weapons with which he has been able to tame wild animals, and all over the world to-day are animals which help man in his work. This part of our animal book tells us the story of the most useful of these animal workers—horses, oxen, zebras, donkeys, mules, buffaloes, elephants, reindeer, camels, yaks, and llamas, and gives us pictures of all these.

ANIMALS THAT SERVE MAN

HORSE
OX
ZEBRA
DONKEY
MULE
BUFFALO
ELEPHANT
REINDEER
CAMEL, YAK, AND LLAMA

CONTINUED FROM PAGE 221

A LONG, long time ago, nearly four hundred years now, a great soldier named Cortes sailed from his home in Spain and conquered a country called Mexico. The people there were in some things very clever indeed. They had made pathways through the water, they had built fine houses and temples of stone. They were skilful in making beautiful ornaments of gold. But these wonderful people had never seen a horse or a donkey!

Wherever they traveled on land they had to go on foot. They had no carriages to drive in, no horses to ride on, and trains had never been invented. They thought horses the most wonderful animals in the world.

What a strange place America would be without our splendid friends the horses, donkeys, and mules! For hundreds and hundreds of years they have been doing work which man alone could never have done. Long before trains and motor-cars were dreamed of, these good, patient, powerful animals had been carrying stone for buildings, iron and steel for machinery, coal for the fires and the furnaces. Neither Europe nor America could ever have become so great had it not been for the help of animals.

There are still places in the world where men have to manage without trains and motor-cars. In those places horses and mules, elephants and camels and llamas, and the yak and the reindeer have to do the work of the trains and motor-cars. Camels are the only animals that can travel in the great sandy deserts; strong, hardy dogs are the only creatures which travelers in the Arctic regions have to draw their sledges. Long, long ago the people of India learned how to tame the buffalo, to make it draw the plough and carts with heavy loads, and to carry a rider upon its back. From India tame buffaloes were taken to Egypt and to Europe. To-day it does most of the work in India and Egypt, as the horse does in our own land.

In its wild state the buffalo is one of the most savage of animals. If hurt it will attack a man or a lion. Even the tiger is then afraid of it. The wild buffalo is much stronger than the tame one; but the tame buffalo is stronger than the ox, and can do more work, and keep working longer. It is very gentle and kind, but if it be badly treated, then it becomes as fierce as the wild ones. The buffalo has a hump upon its shoulders, and must not be mistaken for a bison. The bison lives in North America. We shall hear of that later on. The bison is wild, just as the Cape buffalo is wild. Those of which we are now reading are the tame ones, and among the best of men's animal friends.

This is a zebra, which belongs to the same family as the horse and the ass. Once there was no difference between them, but their habits of life have brought about a great change.

Nearly all the animals which work in this way for man have either hard, tough hoofs, or feet fitted with broad, flat nails. This makes it possible for them to bear the strain of heavy loads without hurting their feet. In the far-away days horses had five toes, just as we have. Even now baby horses are sometimes born with several toes. Now, however, they have usually a hard hoof, and on this men fix a shoe of iron. All the horses we now have in America came to us from Europe. Horses lived in England long before men and women, roaming about the world, came to live there. It was a very different sort of horse from that which now looks so handsome in a carriage. It was of a dingy color. It had a short, stiff mane, and a thin tail very much like a donkey's.

Men were savages in those days, and not a great deal better than the cleverest of the monkeys, though they had sense enough to make friends with the dog, and get it to help in hunting. They used to hunt the horse for food. Then they began to tame it and make it carry them and their goods on its back. It was a long, long time before they had carts.

There were no roads worth speaking of until the Romans arrived and made them. Little by little the horse began to grow nicer looking, as he was well cared for. But the English horse did not become the beautiful, swift creature it now is until about three hundred years ago, when some splendid horses from the Arabs, the finest horses in the world, were brought into that country. Nowadays we have several sorts of horses. There is the great big dray-horse, which can draw heavy loads up steep hills. There is the lighter horse, which trots along pulling a big load in a cart. There is the handsome, high-spirited carriage horse. There is the horse which can gallop fast and far, jumping hedges and ditches, with a man on its back; and there is the swiftest of all, the racehorse, a slim, fiery creature, which is the greyhound of the horse family. If you want to know what our old horses were like, look at the wild horses in the New York Zoological Park, brought from Turkestan. They are very much like the horses of Europe thousands of years ago.

This little Shetland pony is only thirty-two inches high, about as high as a table. He draws the lawn-mower in a beautiful garden and pulls a little girl in a trap.

Horses are very clever animals, and, if kindly treated, love their masters and mistresses dearly. If they do wrong they seem as sorry for it afterwards as a child should be. Some years ago a gentleman was riding home late at night, when his horse jumped with fright at seeing a heap of

The first of these pictures is of a mule; the animals in the second are donkeys. In countries where men have to travel up great mountains, they could not do without these patient animals. They carry heavy things on their backs, and walk along stony tracks up the mountain-sides where no horse could stand.

This is a big dray-horse such as we see occasionally. Horses lived in America long before men and women, but the first horses were queer animals like the foreign horses we see at the Zoo. We see in one of the pictures of this book what the horse was like thousands of years ago, but great care and good treatment have made the horse the handsome animal it is to-day. There are many kinds of horses in America.

white stones on the side of the road. That is what is called "shying." It is natural for the horse to shy and rear and plunge away when it is startled. Ages ago, when the horse ran wild, other savage animals and wild men used to hide in the bushes and other places, and the horse, by rearing and springing aside, would perhaps manage to get away.

A LITTLE PONY THAT PLAYS IN A GARDEN

Well, this horse, which threw its rider from the saddle, ran away. The gentleman could not get up because one of his legs was broken. He lay where he had fallen, in great pain. Presently he heard the sound of galloping hoofs. It was his horse coming back. It had raced home to its stable, and had neighed loudly there as if to tell of the accident, and now had come back to his master. It stayed there watching over him and neighing until, hours later, help came, brought to the spot by the cries of the horse.

It is not always the biggest horse which is the cleverest. A little girl whose portrait is in this book has the tiniest of tiny Shetland ponies. It is smaller than a really big mastiff dog. A big mastiff is thirty-five inches high at the shoulder. This pony is only thirty-two inches high at the shoulder. He has never been taught to do any tricks, but he has plenty of his own. Sometimes he is taken into a beautiful garden to romp for an hour on the lawns. When the gardener is stooping down at his work, the pony will creep quietly up on the lawn behind him, snatch off his cap, and rush away, carrying it in his mouth as a dog would carry a stick.

A HORSE THAT WOULD OPEN THE STABLE DOOR

One horse used to be able to open its stable door with its teeth, and walk off to the fields. Other horses and donkeys used to look out of their stables and wish that they, too, could go. So one day this horse, belonging to a great American general named Jackson, hearing its friends calling as it was going off to the pasture, walked back to the other stables, opened every door with its mouth, and led all its friends off to the meadow with it.

The donkey is supposed to be a stupid creature. He is not really stupid, but he has a firm will, and likes to have his own way. We do not get the best donkeys in this country. In their wild state in the East they are splendid creatures, fleet and strong and proud, and nearly as big as horses. The donkeys of Spain are fine fellows, and in Egypt the donkey is more precious than the horse.

The donkey is the father of the mule, the she-horse is its mother. The mule and the donkey have long ears and long heads, and thin, little tails, with a plume of hair at the end. The donkey can live on very poor food; it is the only animal in this country that will eat thistles. The mule likes the same sort of food that horses have. It lives to an even greater age than the donkey, and is a wonderful hill-climber.

In the countries where men have to travel much in the mountains, carrying merchandise, they could not manage at all without donkeys and mules. These animals climb like goats. They carry heavy burdens on their backs, and walk along little stony tracks up the mountain-sides where no horse could stand.

WHEN TRAMCARS IN LONDON WERE DRAWN BY MULES

The donkey has a wonderful memory, so has the mule. Indeed, a mule's memory is rather a nuisance, for if it gets used to doing a thing in a certain way, nothing will make it alter that habit and do something else.

Some people can remember when tramcars in London used to be drawn by mules. Two big mules, or three small ones, were harnessed to a tramcar, and away they would trot, with their bells ringing, looking like great slim donkeys with their woolly hair shorn off.

A whole book might be written about the elephant. It is the biggest animal in the world; yet, with those it loves, it is the tenderest and most faithful of creatures. The biggest elephants live in Africa, where cruel, senseless men have slaughtered so many that the Government has had to say that they shall not do this shameful thing any longer.

They do not tame elephants in Africa; India is the home of the tame elephant. Most of them are born wild, but they are trapped by skilful hunters, and soon become as tame as horses. They do an enormous amount of work. No other

THE ONLY ANIMAL THAT CAN CROSS THE DESERT

The camel is called the Ship of the Desert. The one at the top is the Bactrian camel, with two humps; the Arabian camels, at the bottom, have only one. The camel is the only animal that can carry men across the desert sands. Its feet have great pads, which open out as it treads. For thousands of years the camel has been carrying men across the deserts. It can carry four men's weight on its back; it carries food and drink in its own body. When it drinks the camel fills many cells, knit together like honeycombs, with water, enough for a week's journey. When thirsty the camel draws water from these cells, and when hungry it draws strength from its hump, which becomes smaller on a long journey, until it almost disappears.

These photographs and many others in these pages are by Gambier Bolton, the celebrated animal photographer; and others are by Lewis Medland, C. Knight, and W. Reid.

animal is so strong, and perhaps no other animal is quite so intelligent. A child may guide an elephant, and they are often used to carry children in India.

A native woman who has to go away from her house takes her little one and places it down before the elephant. The big creature is fastened with a rope or chain to its leg so that it can move about freely. And it takes the greatest care of the child left in its charge. The little one plays about in perfect safety. The animal does not tread upon it, and no savage beast dare come near while the elephant is on guard.

Once an elephant left to look after a child in this way walked round and round in a ring, keeping the little one in the centre. When the child started to trot away, the elephant carefully picked it up with its trunk, and placed it back again in the centre of the ring, so that it could not run off into danger.

AN ELEPHANT CAN PICK UP A TREE OR A NEEDLE

No girl could be more careful of a baby than this, yet this animal nurse was a giant weighing as much as several horses could pull. The biggest elephant ever heard of seems to have measured as much as fourteen feet in height. The biggest ever seen in America was a famous elephant called Jumbo, which our parents will perhaps remember to have seen. It was so tall that if one man had stood upon the head of another, the man on the top would only then have just reached to the top of Jumbo's head. He was eleven feet high, and weighed as much as a hundred men.

The elephant eats hay and green food and grain, and drinks a great quantity of water. It needs so much food to keep it alive and well that you could not pay for its meals with less than twenty dollars a week. The Indian elephant has small ears; the African elephant can always be recognized by its large ears. In other ways they are a good deal alike. With both the trunk is the most wonderful organ. It is like a very long nose divided into two tubes, and crowded with muscles and nerves.

With its trunk the elephant can pick up a good-sized tree, carrying it off on its tusks. It picks up its driver with its trunk and puts him carefully on its back. Yet so wonderfully is this trunk made that the elephant can pick up a needle with it. Here is a true story of the wonders of an elephant's trunk.

HOW AN ELEPHANT GAVE A SICK SOLDIER A PILL

In the island of Ceylon, where there are a great many elephants, there was a young one which had been caught and tamed when it was a little thing.

The doctors at a hospital used to take it round the wards with them in the morning, when it would see the sick soldiers take their medicines and pills. One morning a native soldier dropped his pill on the floor. In an instant the elephant picked it up with its trunk, popped the pill into the man's open mouth, and, with a great puff, blew it down.

The elephant in his wild state plucks tender leaves from the trees with its trunk; food growing about the roots of trees it digs up with his tusks. It takes up water with its trunk and pours it down its throat. When the flies worry, it breaks off the branch of a tree, and, making a hand of its trunk, uses the branch like a fan.

The tusks of the elephant are the long ivory teeth which grow out and downwards from the two sides of its mouth. Some of them weigh over two hundred pounds each. This ivory, which is very precious, is made into all sorts of beautiful carved work, statues, billiard balls, chessmen, and all sorts of ornaments. As servants of men, the elephants are worth far more than their ivory, and people who love these kind, clever creatures regret that they should be mercilessly slain.

AN ODD THING ABOUT THE ELEPHANT THAT FEW PEOPLE NOTICE

The tusk is the elephant's weapon of defence as well as a help in getting food. Sometimes a lion or tiger will attack an elephant. The big animal is not often afraid. If it can get one blow at its enemy with its tusks, the lion or tiger will not need a second blow to kill it, or, at any rate, to make it stop fighting.

The eye of the elephant is very small, but the sight is excellent, while its sense of smell is so keen that this in itself is as good as extra eyes. A blind elephant can make its way about simply by

The reindeer is as precious in cold lands as the camel is in hot lands. It can draw a loaded sledge, and the Laplanders could not do without it.

This is a llama, an animal of South America. It can carry 112 pounds on its back and does not require much food. It has a long neck.

The elephant is the biggest and strongest animal in the world; yet it will take care of a little child. In India an elephant will guard the children of its driver, and while it is on guard no savage beast dare come near. The elephant can pick up a fallen tree with its trunk; yet the trunk is so wonderfully made that it can pick up a needle. Its tusks are very precious; the ivory is made into billiard balls, chessmen, and ornaments. The elephant is one of the truest friends of man, and it is cruel that it should be mercilessly slain.

smelling and feeling its way with its trunk.

There is one curious thing about an elephant which few people notice. Its hind leg is differently shaped from those of other animals. The hind leg of a horse or a dog bends backwards, so that when the animal lies down it draws its hind legs up beneath its body.

Now, the elephant's hind legs are shaped like the legs of men; they bend forward, and when it lies down the elephant stretches its back legs out behind him. This is one of Nature's wonderful provisions to help the elephant. It is so heavy that if its legs were shaped like the legs of other animals it would not be able to get up again when it lay down.

He has a memory which never forgets a kindness; nor does he forgive an unkindness, whether by a man or by another elephant. The story of the elephant spurting water over the tailor who had pricked his trunk with a needle is very likely true. But he did not carry the water in the trunk. The elephant does not carry water like a camel. He uses his trunk to drink with, and when he is thirsty he lets down his trunk like a pipe and draws up the water.

WHY THE CAMEL IS CALLED THE SHIP OF THE DESERT

We all know why the camel is called the Ship of the Desert. It is the only animal that can cross the great sandy wastes where no water is. A horse, or any other animal, carrying a burden upon its back, would sink so deeply into the loose, shifting sand that it would soon become tired. When the wind blows and great sand-storms rage, any other animal than the camel would be suffocated unless protected by its master. The camel has nostrils which he can close tightly, and so keep the sand from getting into his lungs. But most important of all is his power to go without water.

For thousands of years the camel has been serving man by carrying him through the desert, and in the course of time he has become so well fitted to his life that, if he were allowed to go free, he would still make the desert his home.

The feet of the camel are fitted with great, broad pads. As he treads, his big, soft feet spread out and press firmly upon the sand, just as the webbed foot of the sea-bird presses firmly against the water.

WHY THE CAMEL CAN CROSS THE BURNING SANDS

But one of the most wonderful things about the camel is the way he keeps himself from thirst. The inside of the camel is fitted with honeycomb cells, which hold a great deal of water. When he does have a chance to drink, the camel swallows as much water as he can take. After that he can plod bravely across the burning sands for five or six days without tasting water again, carrying on his back a weight of 500 or 600 pounds, and eating nothing but the thorny, prickly food growing here and there in the wilds.

That is the life lived by the camel which carries the loads. There are other camels not so heavy in build, called dromedaries, upon which men ride.

These run along at the rate of eight or ten miles an hour, and can keep on at that pace for a whole day and half the night without taking rest. No other animal could do that.

The Arabian camel has one hump; the Bactrian camel, which lives in colder climates, has two humps. These humps are made up chiefly of fat, and when the camels are on a long, hard journey the humps get less and less, until at last they almost disappear. This is because in his hump the camel carries nourishment, from which he draws strength while he is at work.

THE WONDERFUL STORY OF THE WILD CAMEL OF ASIA

Ever since man can remember, camels have been tamed and used for the service of human beings, but there are camels still wild in parts of Central Asia. They have a curious history. It is believed that, ages and ages ago, a great sand-storm swept over a smiling, fruitful country, where many people lived. The storm buried all the cities, and all the people in them, and only the camels managed to live through it. The camels which are now in that part of the world, wild and free, are supposed to be the descendants of the camels which escaped with their lives in those terrible days.

It would be hard to say which is the most precious animal in the whole world. The man who owns camels thinks that the camel is; the man who owns reindeer thinks the reindeer is.

Among the Laplanders and other people who live in the cold lands, the reindeer is just what the camel is to those who live in hot, sandy lands. It can carry men and packages on its back nine or ten miles an hour, all day long. It can draw a sledge loaded with goods.

Long ago the people of India learned to tame the buffalo, and in India and Egypt this animal does the work that our horses do.

The camel's hair makes brushes and cloth. The hair of the reindeer makes cloth; its skin makes leather, and also the covering of tents and boats; its sinews make cords; its bones make many useful things. Its flesh is food for its master; its fat makes oil for his lamp and for him to drink.

Like the camel, it gives milk which he can drink. Like the camel again, it grows strong on very little food. In winter it has to depend on a sort of moss which grows beneath the snow. The poor creature often has hard work to get a meal, being compelled to dig down through the snow with its hoofs and horns and nose. A Laplander is said to be rich if he has many reindeer.

Although Pizarro surprized the people of South America with his horses, they surprized him with an animal such as no other people have. This is the llama. It is about three feet high at the shoulder, but has a long neck and looks like a camel without a hump. The llama is strong, and can carry a load of 112 pounds on its back. It does not require much food, and is very gentle and good-tempered with its friends. But if it should be teased it does a horrid thing, it spits.

There is an animal for man in nearly every land. In the cold lands which lie thousands of feet high in Central Asia there is the friend of the people of Tibet. This is the yak. It is a sort of link between the sheep and the ox. It has long, handsome horns, like a Scotch ox, but short legs and long hair, which make it look like a sheep. With a load on its back it can travel twenty miles a day, a great distance when you think how terrible the hills are.

When some English soldiers went from India to Tibet all their baggage was carried over the snowy mountains by yaks. The milk of the yak is rich and good, and some of its hair makes ropes and tents, while the better part is used for fine cloth.

This is a yak, an animal that can carry heavy burdens twenty miles a day. Soldiers have their baggage carried up high mountains by these animals. The yak gives milk, and its hair makes ropes and tents.

THE NEXT STORY OF ANIMALS IS ON PAGE 405.

David Livingstone, a poor factory boy in Scotland, went out to South Africa as a missionary and made his home among the savages, where he spent his life teaching the people about the love of God, and in exploring the country. At last he became very ill. "Build me a hut to die in," he said to his faithful servants. "I am very cold; put more grass on the hut." They built him a hut and left him, and in the morning they found him kneeling, dead. This picture shows his servants carrying him home to die.

WHAT THIS STORY TELLS US

WE began, on page 59, the story of the men who have helped to make the world known, and here we read more of the lives and travels of the great discoverers. This story tells us of the great explorers who have made Africa known to the world; who have gone out to that great continent of wild country and savage people, faced great dangers, found great rivers, and made maps of Africa which are so plain that to-day we know the country almost as well as our own. We could never have this kind of knowledge of the countries of the world but for the heroism of the brave men who give up their lives to make these countries known.

THE EXPLORERS OF AFRICA

CONTINUED FROM PAGE 134

WHY do men call Africa the Dark Continent? It is not because the sun does not shine there. Nowhere does the sun shine with more heat and brightness than in Africa.

The reason why we call Africa the Dark Continent is that for hundreds and hundreds of years thousands upon thousands of miles of the land of Africa were unknown to men, because the great continent was so difficult and dangerous to explore. The only means of travel was by boat, and long marches on foot. Now railways are being laid down in Africa and very rapidly the country is being opened up, but even yet travelers who pass beyond where the railway runs have to travel through great forests where there are wild beasts, and insects as deadly as the animals. They have to face fever and plagues. They have to pass through sandy deserts and through lands flooded in winter and parched in summer. All that is very terrible, but it is the only way in which men have been able to make known to the world what Africa is like. For thousands of years men knew almost nothing at all of Africa.

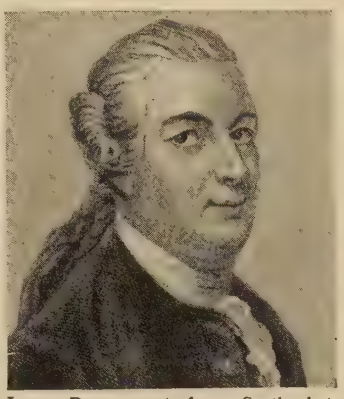
Hundreds of years before Jesus was born, men in tiny ships went sailing along parts of the coast of Africa. Herodotus, a great writer of history, who lived long, long ago, tells us of a man who, more than 600 years before Jesus lived, sailed right down one coast of Africa, round by what we now call the Cape of Good Hope, and up the other side. We cannot be sure whether that really happened, though we believe it did. But men did not dare to go right into the country. They lived up in the North of Africa, and they knew what the land about them was like, but no more. If you look at the map you will find the River Nile running into the Mediterranean Sea. By the sides of that river, in the valley through which it ran, the most learned men of the Old World lived. That was before Greece and Rome had become powerful and learned nations.

These learned men were Egyptians, who made slaves of the children of Israel. It was into their land, the land of Egypt, that Jesus was taken when a child, so that Herod should not have Him killed. They built great cities and wonderful temples and monuments such as have never been built since. They had good laws. They had a way of writing on bricks of clay, and, considering that all the rest of the people in the world were little better than savages, these Egyptians were very wonderful people indeed. Yet they dared not travel far up the river along whose banks they lived.

When the power of the Egyptians died away, there came the civilization of the Phœnician people. The Phœnicians were brave travelers, especially on the sea. They went to Britain when the people there

were only savages. But the Phœnicians dared not go far into the heart of Africa.

Next the brave and skilful Greeks ruled in Egypt. Later still the Romans were the governors—they ruled all the world which was then known. But still no more of Africa was known to them than had been known to the Egyptians. They gave the name of Africa to a small place in the north of the continent by the south shore of the Mediterranean, and they spoke of the rest of the continent, which they had never explored, as the land stretching away towards the setting sun, and they did not know where or how it ended. So the cleverest people in the world lived for thousands of years in a land of which they knew nothing, except just that portion in which they made their homes. It was as strange as it would have been if the English, the French and the Dutch had been content to settle down along the banks of the James, the St. Lawrence, the Hudson and other great rivers that flow through this continent, and never dared to explore the woods and forests, or ventured to cross the mountains.



James Bruce went from Scotland to Abyssinia in 1770. There he found a savage people who would have killed him, but were so amazed by the wonderful things he did that they let him live.

The reason for this fear of the people was that the real Africa lay at the other side of the great Sahara Desert, which no man could cross, because there was no water or food for himself or his beasts; while, if men landed upon the coasts lower down, they found either more deserts or mountains, or terrible forests filled with savage animals. If that man about whom Herodotus wrote really did sail round the coasts of Africa, then 2,000 years passed before another man did it. The man who next did it was Vasco da Gama, of whom we read on page 65. During those 2,000 years many people had gradually made their way inland from the north. The Arabs had come in great numbers, and vast tribes of savage, wandering men from Asia had followed them. But still no white man had been there. At last men began to cross the sea from Europe and settle down on the coasts of Africa. Men from Britain began to explore along the coast. But nothing important was done in this way until 1770, when a daring traveler named James Bruce went through a part of Africa called Abyssinia.

The people of Abyssinia had never seen a gun until Bruce showed them one, and when he shot through a table they thought he was a magician. The king made him master of part of his country, but Bruce spent his time exploring the River Nile and writing a book. People would not believe his book until long after his death.

The people of Abyssinia were then ruled by a king who was supposed to be a descendant of Solomon, the great king of whom we read in the Bible. But they were savage, cruel people. They would have killed Bruce if he had not been a wonderful man. First of all he cured the illness of people in the King's palace, and that made the King and Queen his friends. The people themselves became his friends when they saw the strange things he could

do with a gun. They had never seen a gun before, and they thought Bruce must be a wonderful hunter when they saw him shoot birds flying high up in the air. When he pretended to shoot a tallow candle through a table—which he did to surprize them—they thought he must be a magician. When they saw him tame and ride savage horses, they be allowed to explore. He went through many dangers to discover the source of a river which he believed to be the great Nile. He did discover the source of it, but the river was not the real Nile. It was the Blue Nile, which is the largest of the small rivers flowing into the great White Nile itself. When he wished to return, there were many dangers in his

The STORY OF AFRICA
This map shows the great continent of Africa and helps us to understand a wonderful thing about it. At the top corner on the right hand we see Egypt, with its pyramids and temples, and there, thousands of years ago, people lived in great cities on the banks of the River Nile. Beyond them stretched the great desert that no man could cross, and the great people of Egypt knew nothing at all of the vast country beyond. All this other part, where the trees are in this map, was wild country, and we read in this story how men have explored it and made it known.

wondered still more, and gave him the best horse in all the country, asking him to have it always saddled, to drive in front of him wherever he went.

Bruce did all sorts of strange things to please his savage friends, and the King made him master of part of his country. But all Bruce wanted was to path. He could not leave by the way he had gone in, but had to pass through strange lands, among wild people, who would have killed him if they could. But he got safely to the coast at last, and reached England without an accident. He wrote a great book describing his travels and adventures.

Do you remember how the friends of Marco Polo made fun of Polo's book, and would not believe the stories of his travels to China and India? Well, the same thing happened when Bruce wrote *his* book. People laughed at his stories. They did not believe that there could be such things and such people in the world as he described. Forty years passed away before people would believe him. Then another traveler went to Abyssinia, and found that all that Bruce had written was true. But Bruce was by that time dead; he never was believed while he lived.

How Mungo Park, a Scottish Doctor, Gave Up His Life in Africa

Marco Polo's book made men want to explore the parts of the world to which he had been. Bruce's book made them want to know more about Africa. But to do what they wished was dangerous, and they could do it only very slowly.

Mungo Park was the next man to do anything important. He was a young Scottish doctor, but a long sea voyage to distant parts made him desire to be a traveler. His first adventure in Africa brought him into trouble. Savages captured him, and kept him a prisoner. He escaped, but fell ill in the wilds, and would have died had not a kind native found him and carried him back to the coast. He set off again after a few years, with forty-five followers. By the time he reached the River Niger there were only seven remaining with him. He wrote an account of his travels and sent this back to England, then continued his journey in a canoe. The boat struck on a hidden rock in a great river, and while Park and his friends were trying to get it right again, savages came up and killed them all.

Hugh Clapperton, Who Became a Commander in the British Navy

More and more men now began exploring. Hugh Clapperton, a poor boy who rose to be a commander in the Navy, went out to discover where the Niger rises. He did not succeed in that, but he made other discoveries, and the British Government paid him to go out again. Other men went with him, one of them being Clapperton's servant, a brave fellow named Richard Lander. Clapperton and all the others, except Lander, died on the journey. Lander wrote down all that had happened, and was able to get back to England to tell of important discoveries which had been made. His work was so satisfactory that the Government sent him and his brother out again. They gained more knowledge of the country, but they paid for it with their lives, being at last killed by natives.

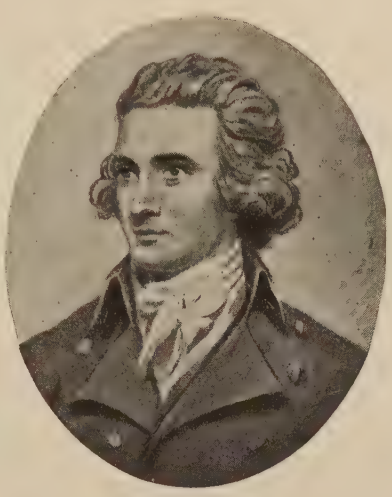
Little by little we were learning to know the land of Africa. Maps were made, and all that was discovered was printed in books, so that nothing might be forgotten. Robert Moffatt, who had been a poor gardener, went out from England as a missionary. Settling in Bechuanaland, in the midst of savages, he converted the heathen and traveled far. Moffatt had a beautiful daughter, and a young man named David Livingstone fell in love with her. Livingstone had been a poor, hard-working boy in a factory in Scotland. But he rose early and worked late, and studied so hard and well that he was able to become a missionary. He had made up his mind to go to China, but a dreadful war broke out there, so he went to Africa instead, and there joined Moffatt and married his daughter.

The Beginning of David Livingstone's Life as Explorer and Missionary

Livingstone wished to start a mission of his own in the Transvaal, but as that could not be he went to the north of Moffatt's home, where no white man had ever been before. On his way he discovered a great lake, called Lake Ngami, and this made him determine to explore the country from side to side. It took him nearly four years to do this. He explored from the lake right away to the Atlantic Ocean on the west: then, turning back, he explored from the east of the lake until he came out on the coast of the Indian Ocean, that ocean into which Vasco da Gama sailed after making his way round by the Cape of Good Hope. Livingstone was often ill, and short of food and medicine, but he never lost courage. Wherever he went he preached the Gospel, and the natives loved him. Some of them followed him as his disciples to the end of his life.

He returned to England for a rest, and then went back again. His wife died in Africa, but though this left him sad at heart and lonely, he carried on his

work of exploring the country and preaching the Gospel to the people. He traced the course of important rivers, and discovered great lakes, like seas, in the middle of enormous forests; and he searched for parts of the country most likely to suit white men. Again he went home to England, rested, and once more returned to make his home among savages and wild beasts, and suffer again from fevers. At last he could go no farther, but settled down, almost starving, and almost dead from illness, at a place called Ujiji. There he was found by a man who had been sent after him with with food and clothes.



Mungo Park was a young doctor who went out to Africa from Scotland. He went up the River Niger in a canoe. The boat struck a rock, and savages came up and killed him and all those who were with him.

As soon as his health was better, Livingstone went on once more with his work, and never ceased until his last illness came upon him. Then he had to rest at Ilala. He was very ill. "Build me a hut to die in," Livingstone said to his men. "I am very cold; put more grass on the hut." They built him a hut and left him, and in the morning found him kneeling beside his bed, dead. The great missionary and traveler had been called home to God while he knelt in prayer. His loving servants knew that his friends would wish to have him buried in England, so they set out to carry his body all the way to Zanzibar, hundreds of miles away. The savages through whose country they had to pass were afraid of the missionary now that he was dead, and thought that if the body passed that way it would bring evil upon them. So Livingstone's followers made up another package and pretended that the body was in it. This they took back and buried. But the real body they hid in a bundle, as if it were merely a parcel of goods, and so got it safely to Zanzibar. From there it was brought to England, and buried in Westminster Abbey.

Hugh Clapperton was a poor Scottish boy who went to explore Africa and died while going out a second time.

Before Livingstone died, his friends in England had been very anxious about him, not having heard of him for a very long time; and another explorer was sent out to find the missionary. The man who went to find him was Henry Morton Stanley. As a boy he was so poor that he had to go to the workhouse school in the little village in Wales where he was born. His real name was Rowlands, but he went to America when a youth, and took the name of Stanley, from an American gentleman who was a good friend to him. He traveled a great deal, and always did his work so well, and had such confidence, that the owner of an American newspaper told him to take all the money he needed and go to Africa to find Livingstone.

So Stanley set out, and on arriving at Zanzibar he got together all the men he wanted, and set off to where Livingstone would be found if he were still living, or where news would be had of his death if he were not alive. Stanley arrived at Ujiji just in time to save the missionary's life. It was a wonderful meeting. Stanley was so glad to find the man whom he had traveled so far to seek that he would have liked to kiss him.

There before his hut stood Livingstone, pale and thin and ill, and very

poorly clad. Around him clustered crowds of natives. Stanley could not show how great was his joy. All he could say was: "Dr. Livingstone, I presume?" This sounded so strange and prim a greeting in that far-off forest, that Livingstone could not help smiling. He raised his cap and politely answered: "Yes." Then Stanley put on his hat and Livingstone put on his cap. The two men gazed at each other, then they clasped hands in gladness, and Stanley said: "I thank God, doctor, that I have been permitted to see you." And for days after that the two men talked the hours away, Livingstone listening to Stanley's news of the outer world, and telling the story of his own adventures.

Stanley left food and clothes and medicine with the doctor, and then returned to tell the wonderful story and make himself famous. Poor Livingstone remained in the dark land to die. Afterwards Stanley went back to Africa as an explorer. He marched round the great Lake Tanganyika; he traced the course of the River Congo to the sea. Afterwards he went to Africa again to rescue Emin Pasha, a German traveler, lost with his men.

Many other famous men have helped to make Africa known. Speke and Grant risked grave perils to explore the great lakes. Sir Samuel Baker made further explorations and found a lake, which he called Albert Nyanza. Wherever Baker went his wife also went.

By this time the whole of Africa was getting known, though not very thoroughly. Great Britain had made the land in the south, called Cape Colony, her own, and from there long journeys to the north were frequently made. People from Portugal and Germany and France and Belgium went to live along the coasts, and from these little colonies men went forth to discover more and more of the interior of the land.

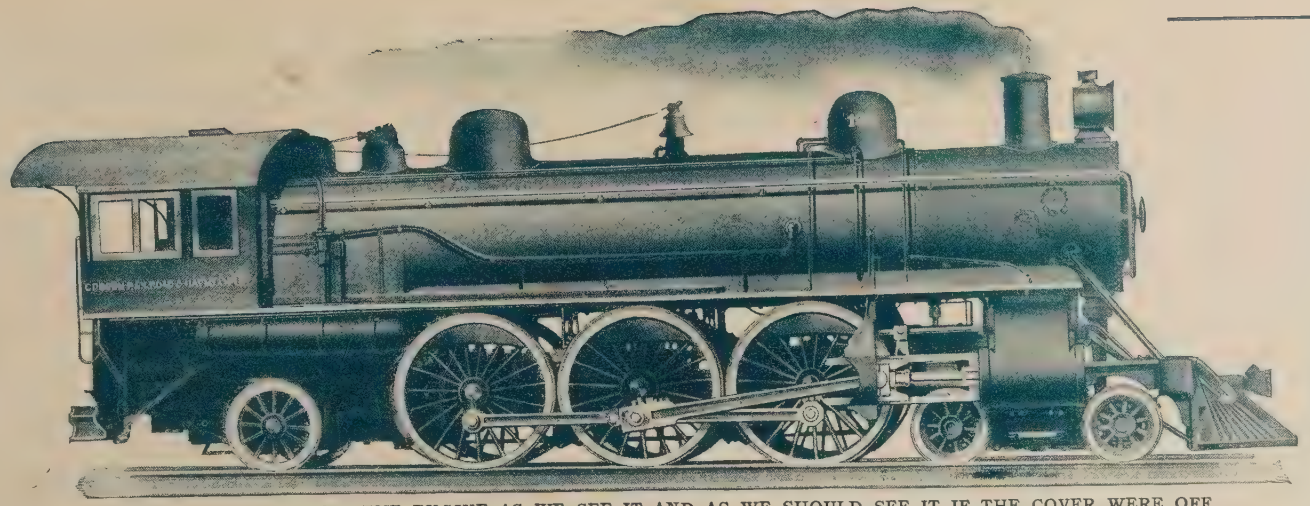
We are getting to know more of the Dark Continent, but we do not yet know all. Africa is three times as big as Europe, and in some parts of it men can only travel a few miles in a day. All this will be changed as more and more railroads and steamboats are built.

When Livingstone was in Africa his friends heard nothing of him for a long time, and H. M. Stanley was sent to find him. After a journey of great peril, he found Livingstone, pale, thin, and ill, standing at the door of his hut. Stanley could not show how great was his joy; he could only say: "Dr. Livingstone, I presume?" For days after that the two men talked, Livingstone telling Stanley of his adventures, and listening to Stanley's news of the outer world. In the picture Livingstone is on the right, raising his cap.

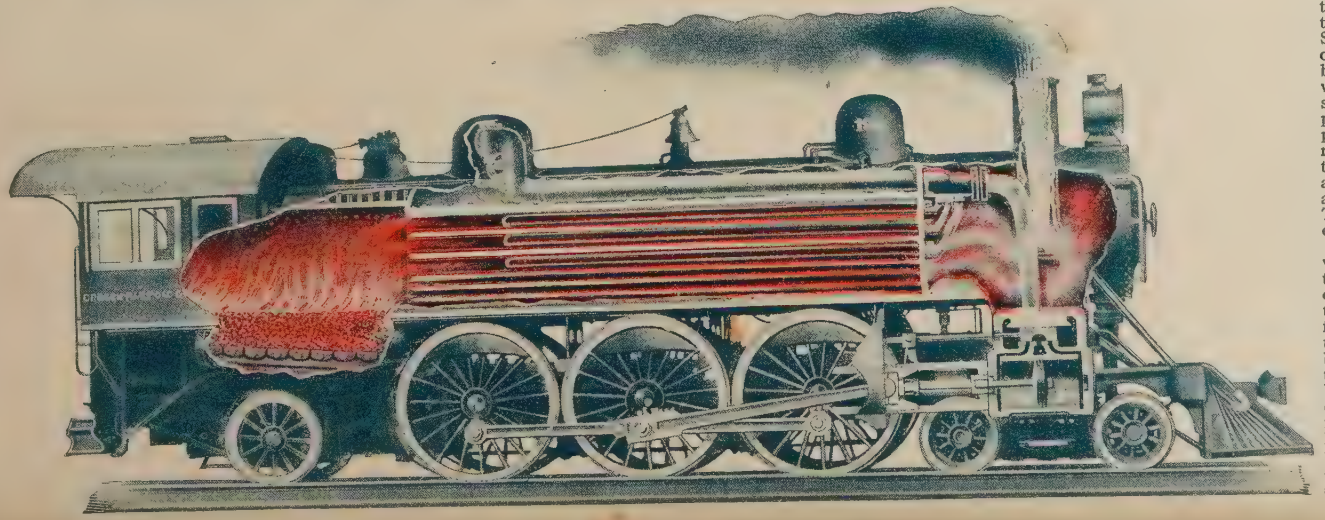
THE NEXT STORY OF THE EXPLORERS IS ON PAGE 363.

THE MEN ON THE ENGINE BY NIGHT

As we sit in our seats, looking out of the window or reading our book, a railway train is almost as comfortable as home. But the men on the engine cannot sit at ease. They must be alert and watchful, and keep up the heat of the fire and speed of the train; they must see that the line is clear, that everything is working properly. They must not lose control of the engine for a moment, and the strain of driving it is something that only a strong man can stand.



THESE PICTURES SHOW THE ENGINE AS WE SEE IT AND AS WE SHOULD SEE IT IF THE COVER WERE OFF

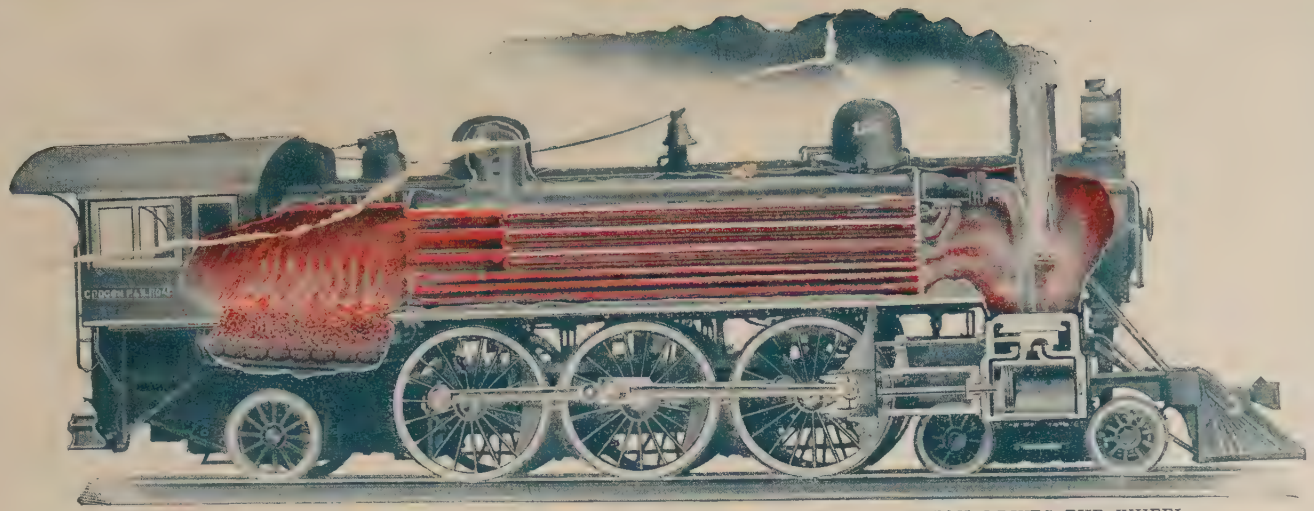


WHAT MAKES THE ENGINE GO?

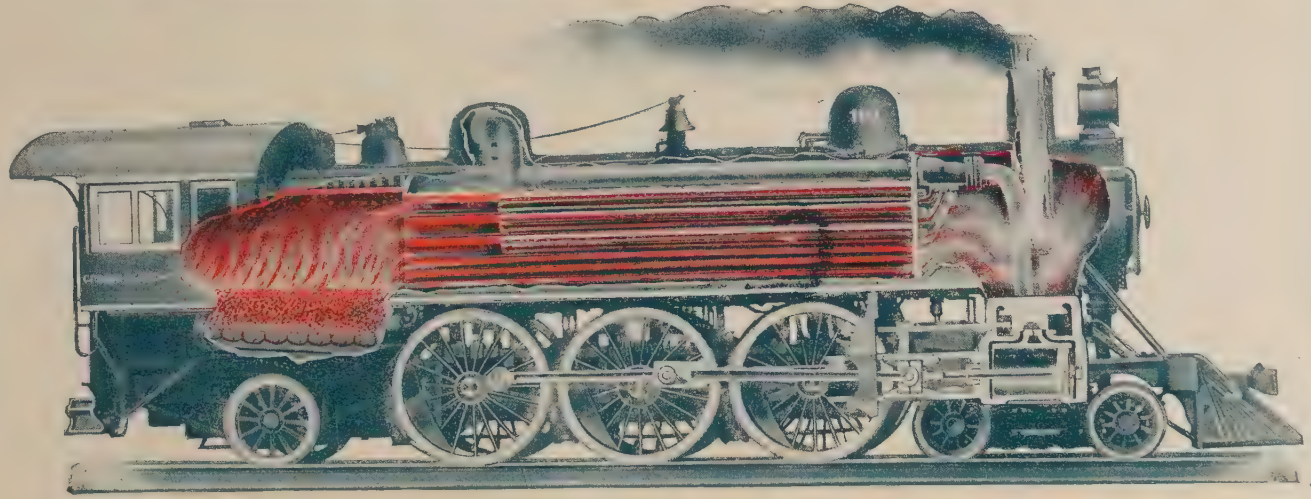
If the outside of a locomotive could be removed, and we could see the machinery and parts inside, as the train went past, we would see what these pictures show us. In the first picture we see an engine as it is. This kind of locomotive is called the "Pacific type," and has three pairs of driving wheels, a four-wheel truck in front, and two trailer wheels under the cab and furnace. The other three pictures show the boiler, furnace, smoke-box and cylinders cut in half.

The locomotive moves because water heated by the fire in the furnace is changed into steam, which expands or enlarges so fast that it can push aside anything that can be moved. So, when it is let into one of the cylinders (which are between the two small wheels under the smoke-stack) by the valve it pushes the rod called the piston forward, when the rear valve is open, as in the third picture, or backward, after the front valve is open, as in the fourth picture. This is what makes the engine move.

The boiler, filled with water, has a number of tubes, or flues, running from one end to the other, so that the heat and smoke from the furnace can pass through them to the smoke-box in front, and escape through the smoke-stack. Whenever we see the red color we know that there is fire and heat. When the heat passes through the tubes the water becomes hot and turns into steam. This goes first into the steam-



THESE PICTURES SHOW HOW THE STEAM DRIVES THE PISTON AND THE PISTON DRIVES THE WHEEL



dome on top of the boiler. When the engineer opens the throttle, by pulling a lever in his cab, as the little house is called, the steam passes from the steam-dome through the pipe which we can see leading into the cylinders. In this way the steam can press on the piston and push it to the one end or the other, thus making the piston rod slide backward or forward, and turning the wheels through the connecting and crank rods.

In this boiler we see also a device known as a "superheater," which consists merely of a number of tubes entering the flues from the front, and bent at the rear end so as to come out again. The steam from the dome, on its way to the cylinders, passes through these tubes, and is exposed to the "dry heat" from the furnace. Steam so heated expands faster and hence exerts greater power.

The steam enters the cylinder through one inlet valve and pushes the piston away to make room for its expansion. At about midway in the travel of the piston the valve is closed, as shown in the second picture, and the rest of the stroke is made by the power of the steam in the cylinder expanding still further. Picture three shows the rear valve open with the steam driving the piston forward. Picture four shows the forward stroke ended and the valve about to open to admit steam to drive the piston back again. This is the way the steam makes the locomotive move.

HOW FIRE AND WATER TURN THE WHEELS

PAST THE BLAZING FURNACES, THROUGH THE SLEEPING TOWN, FLIES THE TRAIN

On the train goes, through the quiet countryside, through the great towns which, even at this late hour of the night, are never all asleep. The great furnaces of the iron-working towns throw a fierce glare of light across the sky and it is a wonderful sight to watch the train come out of the darkness into the light and disappear in the darkness again.

WHAT THESE PICTURES SHOW US

WE read about the men who made the railways in another part of our book. In these pages we see the pictures of a railway train, and we can imagine ourselves on a railway ride in the country. We see the train leave the station in the dark hours of the night. We see the brave men in charge of the train, whose business it is to take us safely on our journey, and to time the speed so well that, even though we travel many hundred miles, the train shall not be late. We see how many men must be watchful at their posts if our train is to carry us safely.

THE GREAT WONDER OF A TRAIN

CONTINUED FROM 242

YOU must have stood some day in a country lane, perhaps in a quiet place far from any town, and watched a train rush past. There is really nothing in the world more thrilling to see than that, especially if it is dark, and the train flies past in a flood of light, like a giant who possesses the earth. That train started from a great town; it flies through towns and villages, past fiery furnaces and smoky factories, through quiet fields where cattle are grazing and birds are singing, on into another busy town that lies ahead.

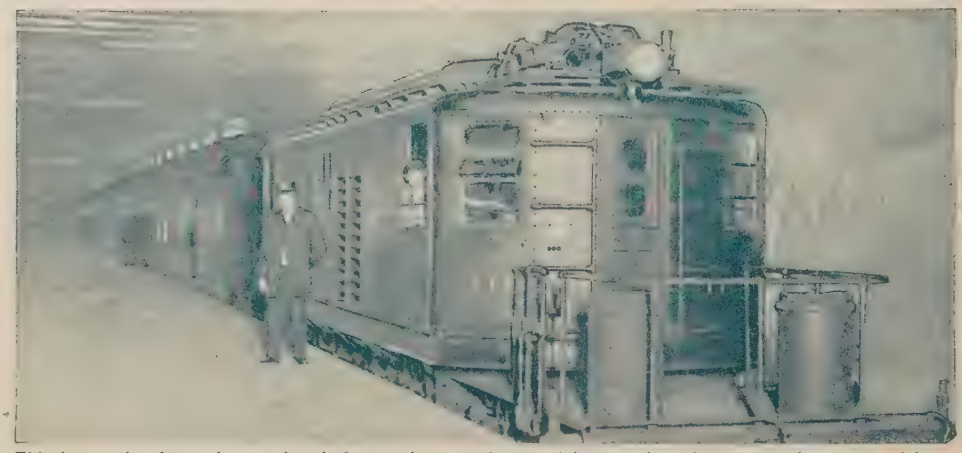
This wonder of the world, the railway train, is one of the greatest triumphs of man. It began with a kettle steaming on the hob—with a man who started thinking for himself about the steam, and wondering what could be done with it. That thinking man has changed the world for you and me, and when we go to the seaside for our holiday, or come to the city to see the sights, or go from town to town to see our friends, we owe our pleasure very largely to a man who sat by the fire a hundred years ago watching a kettle steam.

Perhaps you have not thought, when quietly sitting in a railway car, that you can be safe and happy at such a time only because thousands of men are wide awake and looking after you. It is not enough for the engineer to be always looking out; it is not enough for the fireman to keep the fires burning. If nobody did anything else than that, we should never get anywhere at all, and no railway would be safe. The men in the signal-boxes must attend to the signals. The track-walkers must see that the line is safe. The man at the grade crossing must see that the gates are open. The man at the points where the tracks join must see that switches are in the right position. The man who makes the time-tables must see that two trains are not at the same place on the same track at the same time. The men in the station must be ready for the train when it stops. Somebody must see that the tunnels are free, that the bridges are safe, that there is water for the engine. Every bit of every railway must be examined every day.

And so hundreds of thousands of men are kept busy all day long, watchful every moment, listening, thinking, writing, telephoning, running, shouting, working at a hundred things, in order that we may ride comfortably in the train.

A hundred years ago there was not a single train in America, and there are still many old people who have never been in a train. There are some people who have never *seen* a train. The railway is yet young, but it has grown quickly because it is the first thing that men need when a country begins to grow. Thousands of trains are always running, carrying thousands of people to and fro, and it is a wonderful thing to think that the power which drives them is the same power that makes a violet grow. If there were no sun there would be no trains, because there would be no fuel; and if there were no fuel there would be no steam to drive the giant engines on their way.

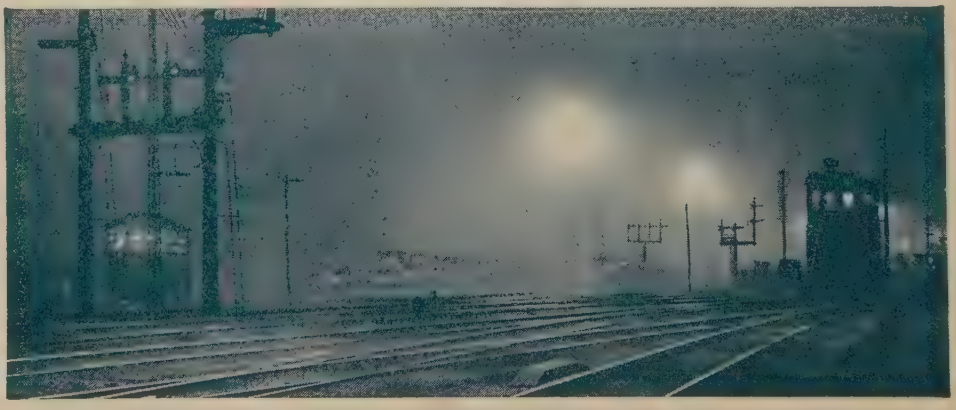
THE TRAIN LEAVES TOWN AT NIGHT



This is a train, drawn by an electric locomotive, starting at night on a long journey, perhaps several hundred miles. Many trains leave at night so that passengers, sleeping on their way, may reach their destination in the morning. A steam engine may take the place of the electric locomotive later.

Here is the other end of the long train. Ahead are the sleeping cars, and the mail, baggage and express cars. A part of the last car is fitted up as a smoking room, with many comfortable chairs.

Pictures by courtesy of New York Central Lines.



NIGHT-TIME ON THE RAILWAY: THE GREAT NETWORK OF LINES AT A JUNCTION

It is not easy to lay a railway. It would be much easier if the earth were smooth and level like a table. But the train must go through tunnels under the earth, through cuttings in the earth, and across great bridges. It must have thrilled us all sometimes to have seen a train run into a hole in the earth, which is exactly what it does when it enters a tunnel. This picture shows the train coming out of the tunnel into the light again.

Sometimes an open way is cut through great hills instead of a tunnel, and in this picture we see how the train passes between cliffs rising to a great height on both sides. Here the earth has been cut away for the lines to be laid, and hundreds of miles of railway in America lie in deep cuttings such as this.

How is a train to cross a river? That question troubled the railway builders once, but it troubles them no longer now. This bridge across the River Tay, in Scotland, shows us how the railway stretches across the river. Over water on bridges, and under water in tunnels, our trains go, as safely as on the land.

Courtesy of the Delaware & Lackawanna Railroad.

For various reasons, railroads in America have often been compelled to change the location of their tracks. This bridge across the Delaware River is on the new line of the Delaware and Lackawanna Railroad, while the old line crossed the river some distance below, and may be seen on the left. The bridge is more than one fourth of a mile long and the rails are 115 feet above the water. No flood can ever harm it.

THE TRAINS FIGHT WITH THE WEATHER

In some parts of our country the snow sometimes blocks the railways. Two or even three engines are often attached to one train. Where the drifting snow fills the cuts, a great snow-plough pushed by several engines cuts out the snow and throws it to the sides of the track. You can see the flying snow in the picture, and the engines pushing behind the great plough.

Water, like snow, may bury the railway, though great floods, like great snowstorms, are, fortunately, rare in our land. But scenes like this take place sometimes, when the engine must fight its way through the floods, traveling along lines which the engineer cannot see. In many parts of the world these things happen often. The engine can run while the track remains and water does not reach the fire.

HOW THE ENGINEER FINDS HIS WAY

On some railroads the signals are worked by hand, but on the best lines they are set automatically. The arms stretching across the tracks are called semaphores. When the arms point down the track is clear and the engineer may go on; when stretched straight across, another train is not far away and the engineer must stop or go slowly. At night lights of different colors show on the other side of the poles.

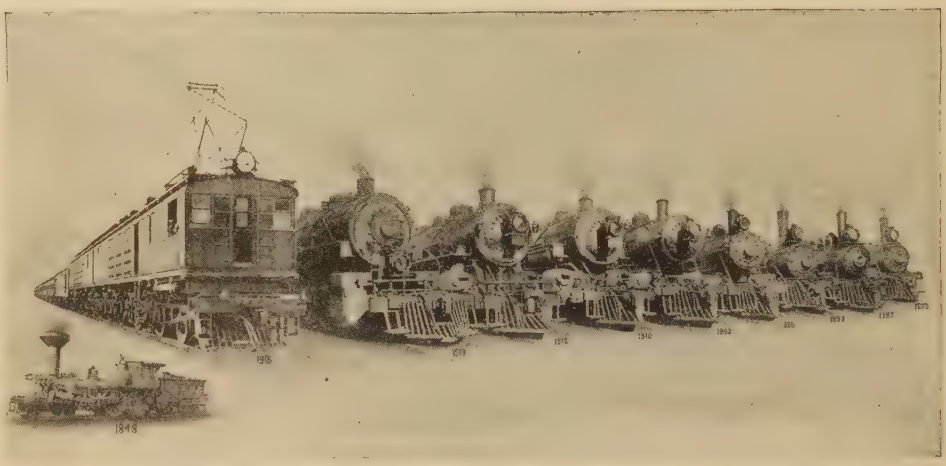
Near the great terminal the few tracks on which the many trains have come divide and spread out like the fingers of the hand. If this were not so few trains could get into the station or out again. Here we see the men who set the switches which divide the trains, sending the first to one track, the next to another, and so on, according to the map of the tracks shown in front of them.
Pictures by courtesy of the New York Central Lines.

THE LUXURY OF MODERN TRAVEL

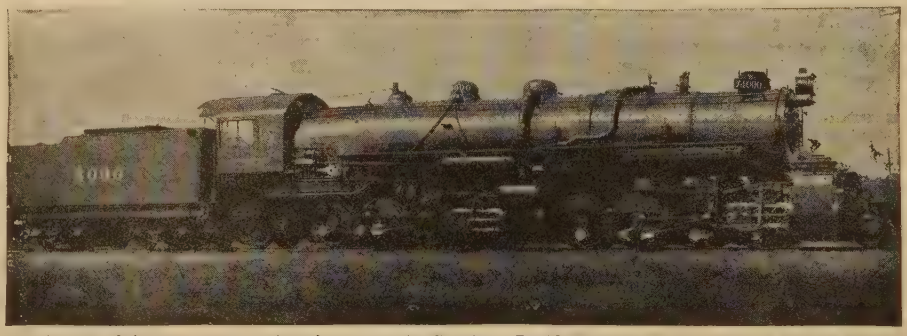
This is a standard Pullman sleeping-car as it appears during the day. At night the two seats facing each other are slipped forward to make a bed. The curved sides of the car are let down, showing another bed above, boards are placed to divide the sections, and curtains are hung in front. You will then see two beds in each section, on which the travelers can sleep quite comfortably.

Nothing adds more to the comfort of traveling than the dining-car. A hot meal equal to that served in a good restaurant may be eaten as you are whizzing along at the rate of fifty miles an hour. The kitchen, complete in every detail, is at the end of the car, beyond where the waiter is standing with his tray. Pictures by courtesy of the New York Central Lines.

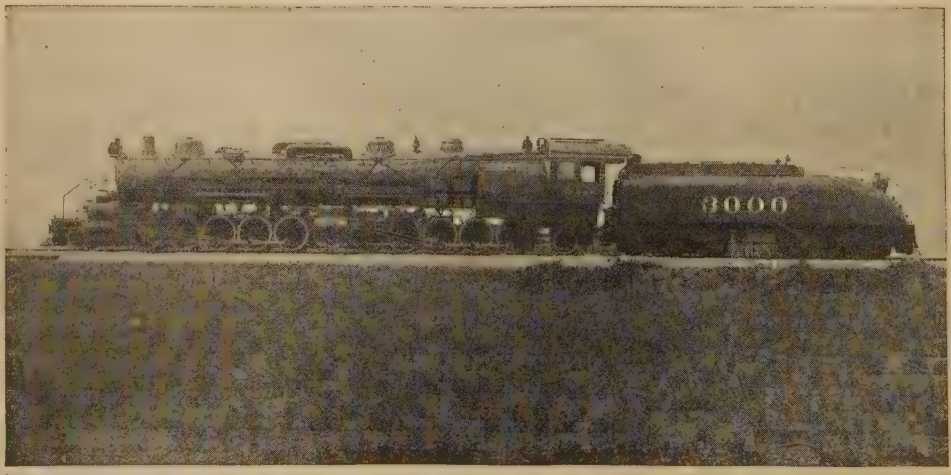
ENGINES OF THE PAST AND OF TO-DAY



On the left is one of the mammoth electric locomotives used on the Chicago, Milwaukee, and St. Paul Railway. The steam locomotives of recent years are shown to the right. In the lower left hand corner is a locomotive of 1848. The tiny engine would be useless upon a modern railroad with its heavy cars.

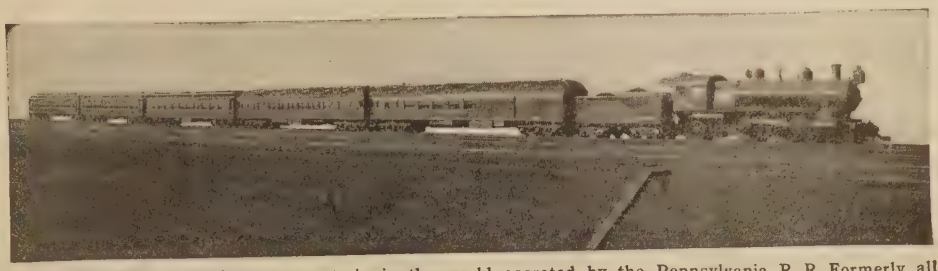


This is one of the enormous engines in use on the Southern Pacific Railroad. It is called a Mogul-Mallet compound, weighs 426,000 pounds, and pulls great loads at a good rate of speed. It is really two engines both very large, joined together and under the control of one engineer. It can pull very heavy trains.

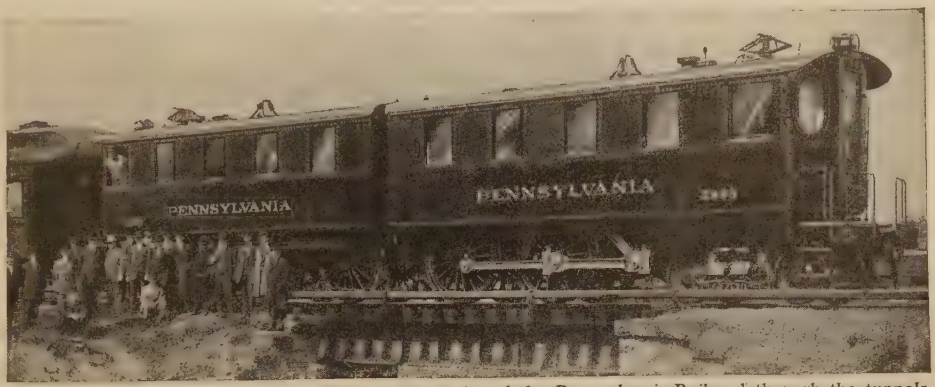


The engine shown above was for a short time the largest in the world, but it has now been surpassed by this ponderous giant. This engine, built for the Atchison, Topeka and Santa Fe Railway, is 125 feet 7 inches long, and weighs 850,000 pounds. It has, as you see, ten driving-wheels on each side, or twenty in all, and can pull trains of immense length. It burns oil instead of coal and can carry 4,000 gallons.

THE IRON GIANT THAT CARRIES US ABOUT



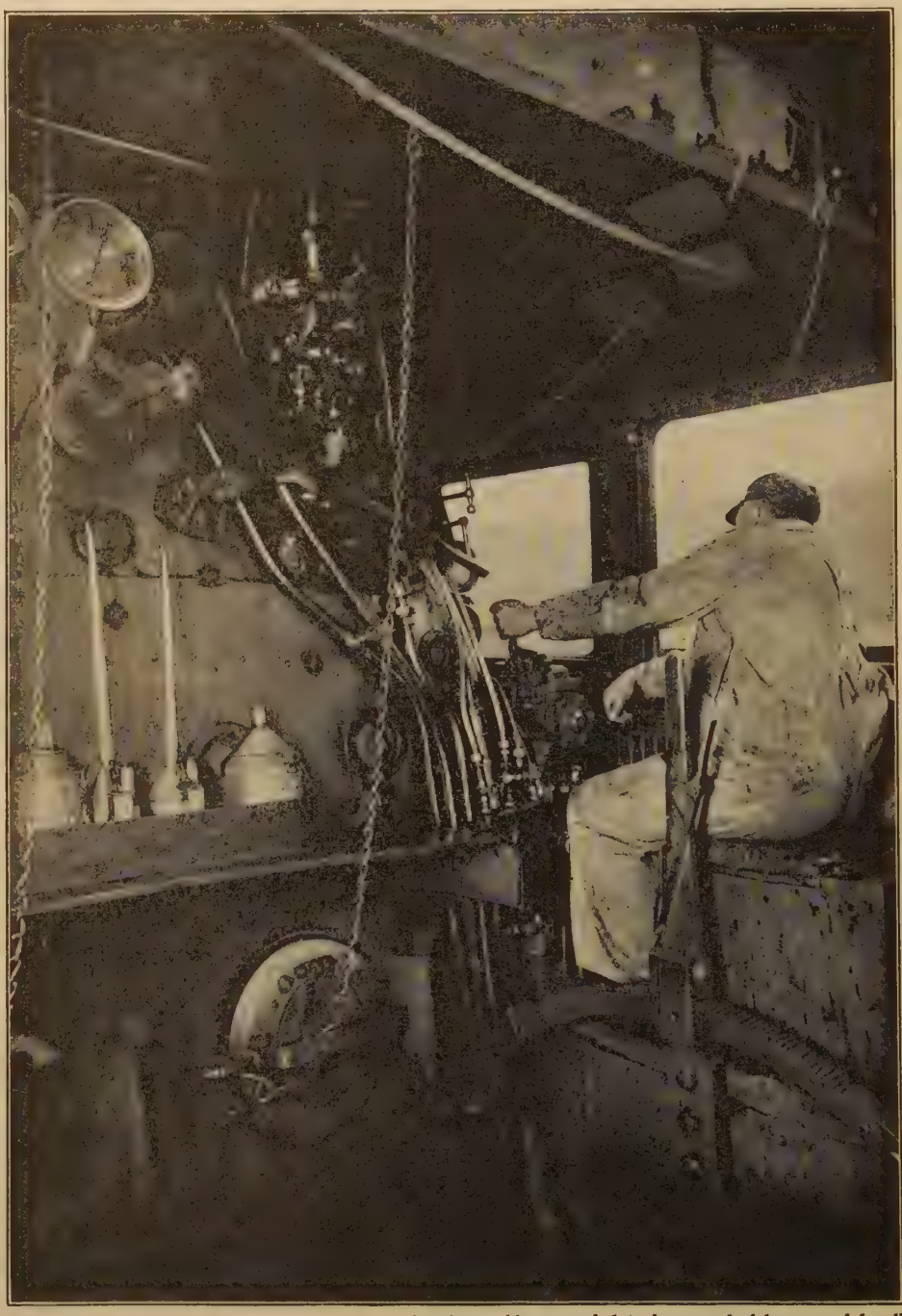
This is the first all-steel passenger train in the world operated by the Pennsylvania R. R. Formerly all cars were built of wood, but in case of collision, or other accident, they were often smashed into kindling wood. If the wreckage caught fire the result was sometimes terrible. It is claimed that the steel cars are much stronger than wooden ones, and, of course, there is no longer any danger from fire. The interior of the cars is cleverly finished to resemble various kinds of polished and varnished wood.



Above is an electric locomotive, used to draw the trains of the Pennsylvania Railroad through the tunnels under the Hudson and East Rivers. This engine gets its power through a third rail, charged with electricity in the same way as the overhead trolley wire. A steam engine must be reversed to run in an opposite direction, but such a one as the above can run equally well backward and forward. The electric engine is smokeless, and far swifter than steam. Compare the electric engine with the picture of the Tom Thumb, found elsewhere in this book, and note its vast improvement upon the first engine run in the United States.

This is a side view of the electric locomotive shown in another place. The Chicago, Milwaukee, and St. Paul Railway was one of the first of the important railroads to use electricity as a motive power, except around stations, and this enormous electric engine is the largest and most powerful locomotive in the world. These ponderous locomotives and the long trains of heavy cars which they draw require very heavy rails and a solid roadbed to support the weight and the pounding of the wheels. Ordinary rails and roadbeds would be crushed by such a train.

THE GREAT MARVEL OF A STEAM ENGINE



In front and on the side of the engineer, as he sits at his post of duty, is a wonderful array of handles and levers, screws and taps. Each of these has a purpose, and by using them at the proper time the engineer is able to start or to stop the train, to go faster or more slowly, to put on the brake, to let off steam, to put more water into the boiler, to blow the whistle, to go backwards or forwards. A thorough knowledge of the engine and a long experience in working it are necessary before an engineer can be entrusted with such a post. An engineer works for years as a fireman before promotion.
By courtesy of the New York Central Lines.

THE NEXT STORY OF FAMILIAR THINGS IS ON PAGE 335.

WHAT THE WISE MAN TELLS US

THE Wise Man tells us in these pages of one of the greatest laws of Nature, the law that makes an apple fall to the ground. Nothing seems more simple, yet no man knows *why* an apple falls from a tree to the ground, or why a stone comes down again when we throw it into the air. What we know about it the Wise Man tells us here. He tells us, too, how the clever little spider spins its web, how the beautiful dewdrops are formed which hang upon trees and grass when we awake in the morning, and of many other things which must have puzzled our minds from time to time.

WHY DOES AN APPLE FALL?

CONTINUED FROM 170

NO one in the world knows *why* an apple falls to the ground, said the Wise Man, when the children asked this question. I mean that though we know the earth and the apple pull each other together—the apple, being small, moving a long way, and the earth, being large, moving a very, very little way—no one knows *why* they pull each other. But everything in the whole wide world pulls everything else in this way, as was proved by Sir Isaac Newton, when, as a boy, he lay under an apple tree in his father's garden, saw an apple fall, and *thought*. "The earth pulls the moon and keeps it running round her, just as it pulls the stone," he said. If the moon stopped moving round, it would rush to the earth as the apple does and as a stone does. So he discovered the law of *universal gravitation*.

Now, the more stuff there is in a thing the stronger is its pull upon everything else. So the earth should pull a big weight more strongly than it pulls a small one, and it does. Then the big weight will fall quicker than the small one, men thought. They forgot that it takes a stronger pull to pull a heavier weight; the heavier it is, the stronger the pull, *but* the more the pull has to do. Therefore, a heavy weight and a small one *fall at the same rate*. If you ask me the right question, said the Wise Man, I will tell you the story of the man who saw this, and how he proved it.

The Wise Man had set them a problem, but one clever boy knew all about it. In the town of Pisa, in Italy, is a famous leaning tower, which has stood for hundreds of years. How does the leaning tower of Pisa stand? asked the clever boy who had read of it; and the Wise Man said:

There is nothing in the whole world quite like the leaning tower of Pisa. Its building was begun more than 800 years ago, since the people who lived in Pisa wanted to have a tower as fine as the great bell tower of Venice. Yet, though the tower of Pisa met with a strange accident that might have ruined it, it still stands, and the tower at Venice fell down some years ago! We know now that the tower was not meant to lean, though it is 13 feet out of the straight line!

The tower was built on wooden piles, driven into ground so soft that when the tower was little more than begun it began to sink on one side. There is no other tower in the world that leans so much as this at Pisa. It is also very beautiful, the outside of it being made of white marble. The tower does not fall because, as they went on building it, they made it in such a way that if you dropped a straight line down from a certain point in the tower, called the *centre of gravity*, which is equally balanced on all sides, by the weight of the tower, that line would touch the ground *within* the foundations of the tower. If the line reached the ground somewhere *outside* the tower, it would fall.

But the tower is very interesting for another reason, said the Wise Man,

and the reason is that its peculiarity was used by one of the greatest men who ever lived, in order to make one of the most famous experiments in the book of knowledge. This man was the great Italian astronomer Galileo, who, rather more than 300 years ago, was a professor in Pisa, and *was thinking for himself*. The great Greek thinker Aristotle, nearly 2,000 years before the time of Galileo, had declared that if you took two balls of the same material, one small and the other large, and dropped them at the same moment, the large one would reach the ground first. If it was ten times as heavy as the small one, he said, it would fall ten times as quickly.

Nowadays, when anyone says anything like this, we always make the experiment at once, and let Nature decide. But in the old days very few men thought about the authority of Nature; they chose some great man, and made him their authority. So for nearly 2,000 years everyone believed and taught what Aristotle had said about falling weights, and in all that time no one made the experiment to find out the truth.

At last, however, came Galileo, and he was thinking for himself. He said that the two weights would fall in just the same time, even though one was heavy and the other light, and everybody laughed at him. It is always a hopeful sign when everyone laughs at you—at least, no one has ever done anything in the world who has not been laughed at. "Very well," said Galileo, "come and watch me make the experiment." So one morning, before the assembled university, professors and students, he ascended the leaning tower, taking with him a ten-pound shot and a one-pound shot. He let them go together. Together they fell, and together they struck the ground.

And so, you think, everyone praised Galileo for having found out a new truth, and he was famous ever afterwards. But one of the terrible lessons we have to learn is that that is not what men usually do in cases like this. What really happened was that everybody abused the young man for daring to differ from Aristotle.

They started hissing at Galileo's lectures, and in a very short time he had to leave Pisa—turned out for finding a truth. The same thing happened to many great men before Galileo, and has happened to many since. It happens now. When you children grow up to be men and women will you see that it does not happen again?

WHERE ARE THE STARS IN DAYTIME?

Where are the stars in the daytime? a child asked, and the Wise Man said:

The stars in the daytime are just where they are at night, and if something could be put over the sun we should see them again. Something is put over the sun sometimes, for the moon comes in the way, so that for a time he cannot be seen, even though it is daytime and there are no clouds in the sky. When that happens, one of the most wonderful things in the world is to see the stars "come out again." They were there all the time, shining as brightly as ever, but the sun is so very much brighter to us—because he is so very much nearer to us—that we could not see them.

When you are listening to thunder, or to a cannon, you do not hear the quiet sound of your own breathing, although the thunder is far away and the breathing is near; and just as the great noise swallows up the little sound, so the great light of the sun swallows up the little light of the stars. There is another way of cutting out the light of the sun so that the stars may be seen in the daytime. Men who work at the bottom of a pit or a well, and look up at the little bit of sky above them, see the stars almost as plainly in the day as in the night.

WHAT IS A DEWDROP?

As night came on and the dew came, great dewdrops hung upon a spider's web stretching across the trees, and a child asked next: What is a dewdrop? The Wise Man said:

Those tiny beads of water look very simple, but it took wise men hundreds of years to find out what they are. Then they found that a dewdrop is part of something very important indeed. There is in the air a great deal of moisture, which cools the rays of the sun so that we are not burnt on a hot summer's day. At night, when the earth passes out of the sunlight, the earth lets out the heat that it has stored up by day, and the moisture causes the heat to escape slowly. If it did not the earth would suddenly become so cold

THE TOWER THAT HAS LEANED FOR 800 YEARS

The great tower at Pisa, in Italy, has been leaning for 800 years; yet it is quite safe, because, when the builders found it was sinking on one side, they went on building it so that the weight of the tower fell in the right direction; and though the tower seems to be falling, it is perfectly balanced. It shows us what is called the law of gravitation, which means that everything *gravitates*, or is drawn, to the earth. The weight of the tower is drawn to the earth, and if the *weight* were on one side the tower would fall. But nothing matters *so long as the pressure of the tower is straight towards the earth*, however dangerous it may *look*.

that we should be frozen to death in a single summer's night.

Well, in the evening, when the earth begins to give off its rays of heat, the moisture in the air drinks in the rays, so that the moisture becomes warmer than the earth and the grass and the flowers, from which the heat rays have come. The grass and the flowers become very cold after losing their heat, and as they grow cold they chill the moisture near them. The moisture, when it becomes cold, turns to real water and falls towards the ground like rain, and the blades of grass, or the leaves of trees, or the spider's web, catch the particles as they fall, and the water, trying to keep itself together as much as it can, gathers into tiny beads. These are the dewdrops.

How does the spider spin its web?

HOW NATURE HANGS HER BEADS UPON A SPIDER'S WEB

A spider's web covered with dewdrops. The spider makes its web with silk from its own body, which it spins into rings and threads until the web is complete. A web is made in about an hour, and is so strong that wind and rain do not break it. There is nothing prettier than the spider's web covered with dew.

another child asked, and the Wise Man told them the wonderful story of the little weaver who leaves his silk patterns on the trees.

HOW DOES A SPIDER SPIN ITS WEB?

Great men say that nothing is more wonderful than the cleverness of the spider. The silk of which it makes its web comes from its body through tiny tubes, like the finest hairs. Many of them come out at the same time, but after leaving the spider's body they are all formed into one rope of silk, which is so thin that a hundred of them together are only as thick as a hair. The end of the silk is fastened to a twig or a leaf or a piece of wood. Sometimes the spider makes the fastening itself, or it may let the silk float from its body for the wind to blow it about until it touches something and clings there.

When both ends have been made fast, the spider is able to run down it and fix several more threads, perhaps twenty, all fastened to different points, but meeting in the middle. These are the cross ropes of the web. Then other lines have to be woven round and round these, making perhaps twenty rings. All this beautiful silk has come from the spider's body. The spider works hard and fast, and when the web is begun the work is finished in less than an hour. The web is then so strong that the wind cannot blow it away and the rain cannot break it.

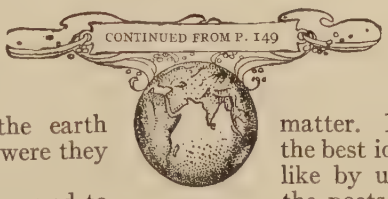
The purpose of the spider's web is to catch insects, so the spider has still much work to do. Insects would not be caught in a web if they could walk or fly out of it, and to prevent their escape the spider covers all the web with stuff like glue, which sticks to anything entering the web and holds it fast. We cannot see this glue with our eyes, but there are thousands and thousands of tiny beads of it dotted all over the spider's web.

THE NEXT QUESTIONS ARE ON PAGE 389.

WHAT THIS STORY TELLS US.

THIS story tells us of the time when the sun and his family of worlds were all one—a great fiery cloud, which at last broke into smaller clouds. One of these was the cloud that formed the earth, which became at last a glowing globe of gas, hot at the centre and cooler at the surface. Slowly the gas became liquid—like water, but red hot. There was then no living thing on the earth, which was like a red-hot ocean. As the earth spun round in space an extraordinary thing happened: part of the red-hot stuff fell away, like drops from a wet umbrella, and formed the moon. Slowly the globe cooled down and the hard surface of the earth was formed—the great ball of earth, still glowing inside perhaps, on which we live.

HOW THE EARTH WAS MADE


CONTINUED FROM P. 149

AND now we must ask ourselves again the great question: Where have the sun and the earth come from, and what were they like at first?

For a long time men used to think that the solar system, including the sun and the earth, had been, from the first, as they are now. No one now thinks that, however. We believe that they have grown, so to speak, to be what they are, and we have a fairly good idea of the way in which they have grown. Now, in order to see what the solar system was like at first, we have only to take a telescope and look up at the sky, and there we shall see scores of thousands of wonderful bodies which are still at the stage at which the solar system was at long ages ago. These bodies are called nebulæ, and one of them would be called a *nebula*, which is simply the Latin word for a cloud. They look like the tiniest little bright, fleecy clouds in the sky. Some of them can be seen with the naked eye, and then they look like stars, but they are quite different from stars.

You can understand that if a great number of stars were clustered together, very far from the earth, they might look to us like a little bright cloud, or nebula, and then, if we got a strong telescope, we might find that they were really only a cluster of stars. However, we now know for certain, by examining the kind of light that they send to us, that the sky contains at the very least, 120,000 real nebulæ. They are not star-clusters at all, but glowing clouds of matter. Perhaps you can get the best idea of what a nebula is like by using the name which the poets often call it by, and that is *fire-mist*. A nebula is like a great mist of fire. Those we see in the heavens are of different shapes and sizes. Many of them are far bigger than the whole space occupied by the solar system. A great many of them, probably about half, have a shape very like the kind of firework called a St. Catherine's wheel—flattened and coiled up. They are called spiral nebulæ. You know what a spiral staircase is. The spiral nebulæ, however, ought never to have had that name, because they are not at all like a spiral staircase; they are quite flat, thin things, much more like a St. Catherine's wheel in shape.

If we look at some of these spiral nebulæ we see bright points in them here and there, which suggest to us that the fire-mist has become thicker at certain places than at others. Often these bright points are so large and bright that they look like stars, and, indeed, probably they are stars. Probably all stars are made out of nebulæ. Now let us come back to our solar system.

If you could look at the solar system from a great distance away you would notice many remarkable facts about it. In the first place, you would notice that all the twistings and movements are in one direction,

as we have already said; then you would notice that the solar system is a flat thing. The picture of it that we saw on page 140 is not far wrong in its suggestion of the shape of the solar system. All the planets, so to speak, go round the sun at much the same level. You know that if you took two hoops you might put one inside the other, so that whilst the one hoop was upright on the pavement the other lay across it; then anything traveling along the rim of the one hoop would be traveling round and round, and anything traveling along the rim of the other hoop would be traveling up and down. Now, that is just what we do not find in the case of the solar system. It is a flat thing like a system of hoops of many sizes, all laid on the ground inside one another; and the spiral nebulæ are also flat.

Now, there is another curious fact, and this is that the kind of stuff the sun is made of is the same as the kind of stuff that the various planets are made of. It almost looks—does it not?—as if our little earth and all the planets were once a part of the sun.

THE SUN IS MADE OF THE SAME STUFF AS THE EARTH

And so men guessed that perhaps the pieces of stuff that now make the planets have been somehow brushed off from the sun, and that as they cooled down they had become solid and started traveling round and round him. We are sure now that that is not what happened, but we are also sure that the idea underneath that notion was right. The sun and all his planets were once one.

Indeed, we believe that in its first stage the solar system was nothing else than a nebula, like one of the very smallest of the thousands of nebulæ that we now see in the sky. No one who has studied the subject now doubts that; still, we are not certain as to exactly how such a nebula would gradually become changed into the solar system that we know. It seems to be certain, at any rate, that a nebula is apt to become flattened and also to take on the shape of a St. Catherine's wheel. Far too many of the nebulæ are of that shape for us to imagine that there is not some good reason why they should be so, and I have little doubt that if we could live long enough to watch the nebulæ that are not spiral we should see them gradually become so.

Now, there is one great fact that must always be true of a nebula like this. It is a fact which is true everywhere; and though it has rather a long name, it is not difficult to describe. We are certain that in the course of time this fact must work great changes in a nebula—such changes as we believe to have been worked in the nebula from which the solar system was formed.

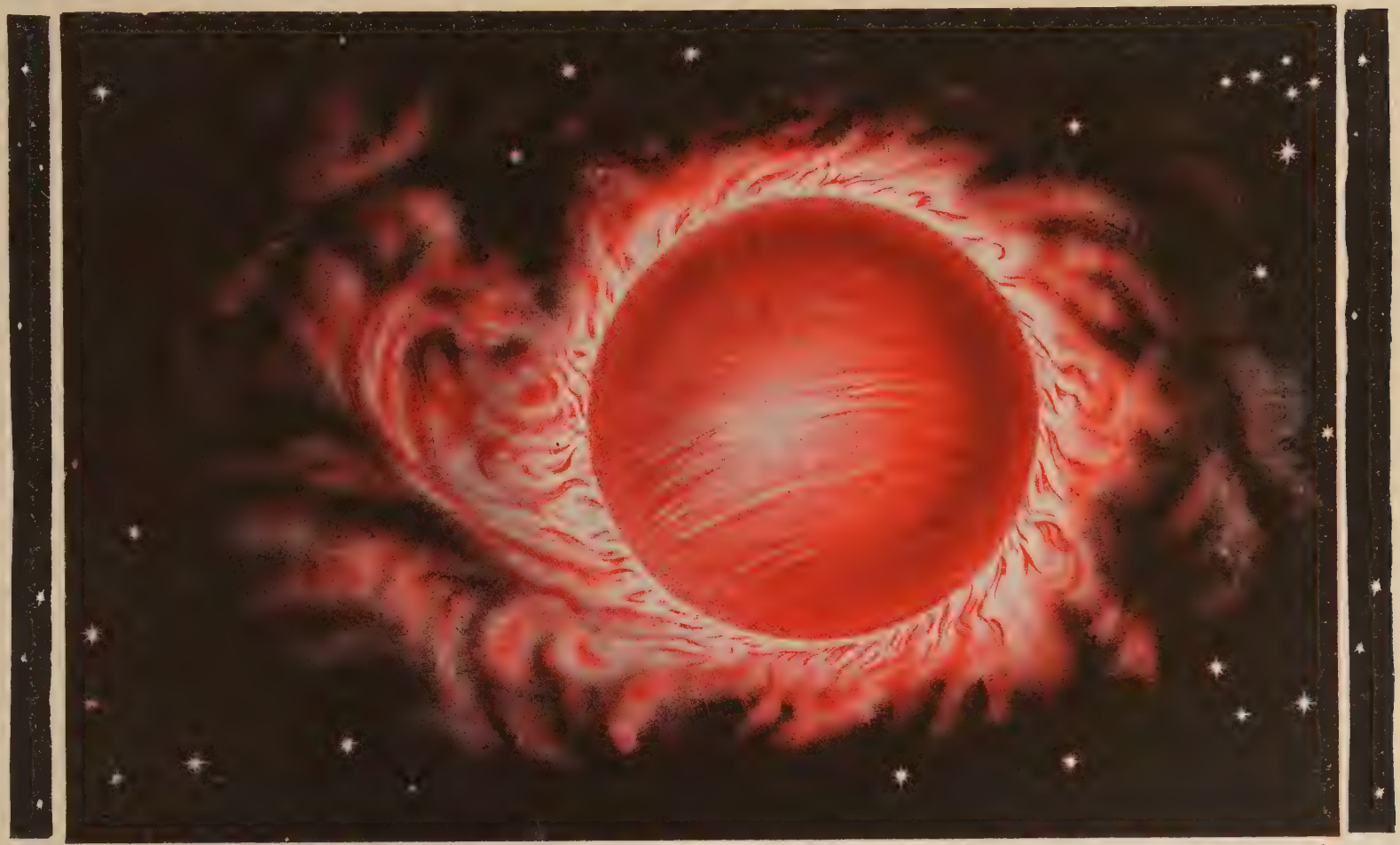
WHAT HAPPENED WHEN SIR ISAAC NEWTON SAW AN APPLE FALL FROM A TREE

This fact is called *gravitation*, and it simply means that every tiniest piece of matter, or stuff, in the whole world has a natural tendency to attract and be attracted by all the other matter in the world. Gravitation is, perhaps, the most familiar of all facts in our daily lives. When you let go of a ball it drops to the earth, and that is simply because the earth and the ball have attracted each other. The ball is so small that it moves the earth to itself only a very little distance, and what we see is simply that the ball falls to the earth. One of the greatest men who ever lived, an Englishman called Isaac Newton, was lying on his back, under the shade of an apple-tree in his father's garden. He was not just dreaming his time away, however, but thinking; and he saw what thousands of people had seen before him, but never troubled to think about—an apple falling from the tree to the ground. The result of his thinking about this was that he discovered this law of attraction, which is true throughout the whole wide world, not only of the earth and a ball or the earth and an apple, but also of the earth and the moon, the earth and the sun, and also of all the little pieces of stuff, or matter, in a nebula.

HOW THE GREAT CLOUD BEGAN TO COME TOGETHER AND FORM THE EARTH

From the first moment that a nebula was formed, then—probably by a collision between two stars or more—there would begin to act upon all its parts the same force of gravitation which acts upon you if you miss your footing and tumble downstairs. And this is a force that goes on acting all the time, never ceasing and never getting tired. So, some years after the great work of Newton, several men began to apply his

THE GREAT BALL OF FIRE THAT COOLED DOWN AND BECAME THE EARTH



When the earth was being made, it traveled through space like a ball of fire, and red-hot waves rolled over it. Parts of this stuff were thrown off, and these probably formed the moon.

ideas to the nebulæ (remember that when the word is spelt like this it means not only one nebula, but many) and to ask what must happen in the course of ages when this force of attraction acts upon such a nebula.

HERSCHEL, THE MAN WHO MADE A LIST OF THE GREAT STARS

One of the greatest of these followers of Newton was Herschel, who made finer telescopes than any one had used before, and who spent all his life studying the stars and the nebulæ. He was the first man who ever made a list of nebulæ, and he it was who first saw that they may be arranged in classes, from those which look just like little milky clouds and nothing more, to those which are really stars with a sort of cloudy substance around them.

So it seemed to him that some "clustering power" must be at work turning these scattered and milky nebulæ into brighter and smaller objects which would some day become stars or suns and solar systems. Herschel compared the heavens to a rich garden containing plants in all stages of their lives. This gives us the advantage, he says, that at one and the same time we can see all the different stages in the history of plants—from their birth to their death; so also in the heavens we can see all the different stages from a nebula to a star. Then there followed a great Frenchman who saw that the "clustering power" must be gravitation, and who worked out exactly what must happen in such a case, since we know exactly the force with which gravitation acts.

WHAT PROBABLY HAPPENED WHEN THE EARTH WAS COOLING DOWN

Now, in order to fill in the history of the solar system we have to reckon with two facts. We have already seen that the sun and his family are not still in space, but are moving all together through it. We cannot, indeed, believe that there is stillness anywhere; everything is moving. Now, for a long time this movement of the nebula from which the solar system was formed did not seem to be very important; at any rate there seemed no reason why it should help us to understand how the solar system was formed. Men used to think that space outside it was quite empty as far as the nearest of the fixed stars. But we are now learning that space is very far from empty. On the contrary, what we used to think was empty space is simply swarming with those little bodies like grains of sand or pebbles, or even larger bodies still, which we have already described as being found within the solar system. It is quite reasonable to suppose, then, that as the nebula went through space, gradually becoming smaller and denser by the force of gravitation causing it to shrink, it would come across millions and millions of these grains and pebbles, which, of course, are also rapidly moving.

Many interesting consequences would follow. If the nebula ran across a great swarm of meteorites, like those the path of which the earth crosses in November, then there might be the beginnings of a planet. But, even apart from such a swarm, there would be marked results from the millions of little collisions that would be constantly happening. For one thing, the nebula would be made hotter, for when anything in moving strikes anything else, or is partly stopped by it, its motion is turned into heat which is itself a kind of motion. We use this fact every time we strike a match. We put the match in motion and then partly arrest the motion by whatever we rub it against; so there is enough heat produced to set the match on fire.

THE EARTH MAY ONCE HAVE BEEN SHAPED LIKE A PEAR

That, then, is all that we can tell at present about the origin of the sun and his family. Men who work at these things are constantly filling in little details, explaining the small difficulties and helping us to gain a complete picture. But everyone is agreed that something like what we have described is what really happened.

Now let us try to imagine what our own earth must have been like in its beginnings. The most important facts we can be quite sure of, even though we are not quite sure about every step in the way in which the earth first came to be separated from all the rest of the family to which it belongs. We cannot be quite certain as to the shape of the earth at first, though some men who have been studying this matter in Oxford just now think that it may have been shaped like a pear instead of like a flattened orange, as it is now. But,

at any rate, whatever its exact shape was, it was so utterly different from the earth we know that we can scarcely imagine it. Really, the earth of long ago must have been far more like what the sun is now — only, of course, quite tiny compared with the sun.

THE AIR IS PART OF THE EARTH AND MOVES WITH IT

The earth, as we think of it now, is something that stops suddenly at the surface — at the level of the ground. That is, however, by no means quite correct. Even now the earth does not stop sharply all round as an orange does. We must not imagine that the earth stops at the level of the ground or at the level of the water, and that we are really walking outside the earth.

Not at all. Above both the ground and the water there is something which is really part of the earth, though we cannot see it. It moves with the earth round the sun, and twists round with the earth as it spins. The stuff of which it is made is constantly being exchanged in both directions with the water of the sea and the stuff of which the dry ground is made. In short, the air is part of the earth, and if we lived on another planet, and looked at the earth from afar, we should never question this for a moment. The air as it is at present probably extends upwards from the surface of the solid and liquid part of the earth to a distance of about 100 miles. As we pass upwards through the air in a balloon we find the air becoming more and more thin, or, to use the proper word, more and more *rare*; and though we cannot go very far in a balloon, we are quite sure that this rareness goes on increasing until there is no air to be found at all.

WHEN THE EARTH WAS A GREAT GLOWING GLOBE OF GAS

So even now, you see, the earth does not really stop short sharply anywhere, but its stuff is spread out all round it in a layer, which gradually becomes rarer and rarer, until at last it stops altogether.

Now, that was certainly true of the earth long ago, and no one who could have seen the earth then would have had any doubt at all that the air was part of the earth; for the earth then, we must learn, did not consist of anything at all like what we call "earth," but it consisted altogether of gases like those of which the air is made to-day. If you take anything you please and make it hot enough, you will be able to turn it into a gas; and the earth in its beginnings was so hot that all the stuff in it was in the form of gas. Even the stuff that now makes the hardest rocks and stones, not to mention every drop of water in the sea, was then gas.

What we now call the earth was at first nothing more or less than a great globe of glowing gas. In that hot, twisting, glowing globe there were contained all the tiny little portions of matter, or atoms, as they are called which now make up the water of the sea, the soil, the rocks, the bodies even of all living things, and also, of course, the air, or mixture of gases, that still remains covering the whole earth like a warm blanket.

WE LIVE AT THE BOTTOM OF AN OCEAN OF AIR

So far are we from being really on the surface of the earth that the whole earth, sea and land together, is really covered with a great sea or ocean of air. We crawl about at the bottom of this ocean, and the thing we are puzzling our heads about just now is how to learn to jump off the bottom and swim in it, as birds have been able to do for ages without troubling their heads at all.

In the course of time we know that great changes had to happen in this glowing globe of gas. It was doubtless then giving out light and heat like a little sun, but in doing so it would gradually become cooler. If you make a poker red hot, and then take it out of the fire, it will give out light and heat for some time; then it will give out heat only, but no light — which is to say, that it is still hot, but will have become dark; and lastly, it will become quite cold. It cannot give out light and heat without becoming cooler itself, for it does not make them out of nothing. The case was the same with the earth, and in the course of long ages she had gradually to become cooler. At last she would have to become so cool that part of the stuff of which she was made would no longer be a gas, but would become liquid, like water. This is a perfectly simple thing which you have seen for yourself a

hundred times—whenever you look out of a railway carriage, for instance. As you breathe, a great deal of water comes out of your mouth and nose. This water, having come from the inside of your warm body, is itself so warm that it is in the form of a gas; but when this warm gas strikes the cold glass of the window-pane it is cooled so much that it is turned into a liquid, and will run down the pane in little drops, especially if you help it by rubbing it together. If you cool any gas sufficiently, it must become liquid.

Now, that part of the earth which would soonest become cooled would not, of course, be the hot inside—which is believed to consist of a gas at this very moment—but would be the part next the surface. All the kinds of stuff that were most apt to become liquid would do so, and, being heavier, would fall towards the centre; whilst the kind of stuff, like the air of to-day which is not so apt to become liquid would stay where it was.

THE RED-HOT TIDES THAT ROLLED OVER THE EARTH LONG AGO

So you can imagine an earth with a core of hot gas and a layer of liquid outside that, and then a layer of cool gas, or air, outside that. But soon even part of the stuff that had become liquid would become solid, or perhaps like a very thick oil.

Now, it must be remembered that all this time the earth was twisting round and round like a top, as it has done ever since, and as it is doing to-day. Also it must be remembered that the great sun is all this time pulling as hard as it can upon the earth by means of gravitation. You can imagine, then, that the liquid stuff next the sun at any given moment would be apt to be pulled out towards the sun or heaped up at the surface of the earth. But, of course, since one point of the earth is never opposite the sun for long, this heaping up of the liquid on the surface would be like a wave traveling over the surface of the earth. Now, this great traveling wave is nothing else than a *tide*, and every child who has ever been to the sea has seen its consequences. Only the first tides that were raised by the sun upon the earth were not tides of cold water, for I am quite sure that there was no liquid water upon the earth at that time at all.

The earth was too hot for that, and all the water in it was in the form of a gas in the air, just like the water in your warm breath before it strikes the cold window-pane. The first tides that rolled upon the earth must have been terrible tides made of stuff like red-hot lava—the red-hot stuff that comes out of a volcano and runs down in fiery streams until it turns cold and solid.

HOW THE MOON WAS FLUNG OFF FROM THE SPINNING EARTH

Now, it is much more than probable that a very remarkable thing happened somewhere about this time. The men who have studied this subject believe that one day, whilst these tides of lava were rolling round the earth as she spun, part of the stuff was whisked off like drops from a wet unbrella when you spin it. It is even possible that two great lumps of stuff were whisked off at about the same time—one from one side of the earth and one from the other. Perhaps at this time the surface of the earth had become cool enough for the great gaps left by this loss to remain more or less fixed, and some people have supposed that those gaps are now the great bites into the surface of the earth which have since been filled by the seas. They would not be filled with water then, because the earth was doubtless still so hot that all the water still remained in the form of a gas in the air.

But what became of the stuff that was so whisked off from the surface of the earth? I wonder whether you can guess. Its shape at first, of course, would be very irregular, but as it went on moving and became cooler, and as its parts acted upon one another by gravitation, it would become round.

THE DISTANCE OF THE MOON, OUR NEAREST NEIGHBOR, FROM THE EARTH

Now, surely, with all these hints, you do not need me to tell you that it is the moon which men believe to have been formed from the earth in this wonderful way. At first she was very near the earth, and for a long time afterwards she went gradually farther and farther away. But even now the moon is really close to the earth, not so far off as ten times round the earth.

THE NEXT STORY OF THE EARTH BEGINS ON PAGE 425.

SCENES FROM SHAKESPEARE STORIES

Oberon, having quarreled with Titania, caused Puck to drop some magic juice into her ey so that when she awoke she would love the first thing she saw. Bottom, a weaver, whose head h been changed into that of an ass, was the first creature Titania saw, and she fell in love with hi

Petruchio was a gentleman who undertook to "tame" Katharina, a very hot-tempered lady whom married. His plan was to pretend he was always in a temper. He dressed absurdly, and when proj clothes were brought in he threw them on the floor and behaved so badly that at last Katharina s it was best to obey her husband. His plan succeeded, as we learn in "The Taming of the Shrew

THE WORLD'S GREAT BOOKS

BOOKS are among the most precious things man has been able to invent. The world's great books are its greatest treasures. For the man who writes a book may tell us a story that will never be forgotten, or he may express some great thought that will set all other men thinking. It is through books that we know nearly everything. There are two kinds of writing—prose and poetry, about which you can read on page 101. Great books may be written either in prose or in poetry, but here we shall deal with the famous books just as if they were written in prose, as it is the long stories they tell which we are going to tell over again in the form of short stories. The dramas of William Shakespeare, which are chief among the great treasures of English literature, were all written in poetry, but we shall tell the stories of these famous works just like other stories. Though Shakespeare's plays were written for acting on the stage, they are also among the most beautiful books that we can read.

THE PLAYS OF SHAKESPEARE

A MIDSUMMER NIGHT'S DREAM

By J. A. HAMMERTON

THERE was once a Duke of Athens named Theseus, who was betrothed to Hippolyta, Queen of the Amazons. It happened that when they were talking of their coming marriage, an elderly courtier named Egeus came to them with his daughter Hermia and her two rival lovers, asking for the help of the Duke. It was her father's wish that Hermia should wed Demetrius, and she would have none but Lysander. On hearing this Theseus told her that, by the law of Athens, she must do as her father wished, else she could be put to death or condemned to remain unmarried all her life.

Hermia was fain to profess she preferred to remain unmarried. But when she had drawn apart with Lysander they agreed to meet the next day in a wood a mile distant and escape from Athens together. They took another into their secret, however, and told their plans to Helena, a friend of Hermia. As Helena was in love with Demetrius, she thought that by telling him of Hermia's purpose he would follow the lovers, and poor Helena herself would go after them so that she might have the happiness of being near Demetrius, although he was not fond of her.

About this very time, Oberon, the king of the fairies, had quarreled with his queen, Titania, because she would not give him a little negro boy, of whose mother she had been very fond. Oberon decided to play a trick on Titania for this, and so he told Puck, his mischief-loving fairy servant, to put the magic juice of love-in-idleness into Titania's eyes as she slept, that when she awoke she would fall in love with the first living creature she might see.

It so chanced that a company of rough workmen were rehearsing in that wood a little play which they were to perform at the wedding festivities of Duke Theseus, and by a magic touch Puck changed the head of one named Bottom, a weaver, into that of an ass! This fat, ungainly man with the ass's head was the first thing Titania, the lovely queen of the fairies, saw when she had rubbed the sleep from her eyes, and, thanks to the juice of love-in-idleness, she straightway fell in love with Bottom, wound her arms about his hairy neck, bound flowers around his flapping ears, and bade her fairy attendants obey his every wish.

Puck had also been told by Oberon that an Athenian who was lost in the wood was neglecting his true love for a maid who shunned him, and he bade the mischief-making fairy change the heart of this misguided Demetrius. But Lysander and Hermia, wearied with their walk

from Athens, were lying down to rest when Puck came flying past, and, mistaking Lysander for Demetrius, the fairy squeezed the magic juice into his eyes. Then, Helena coming up as Lysander awoke, he immediately told her of his love for her. The charm had worked on the wrong lover. Lysander now left Hermia, and followed Helena, who always fled from him, as she still loved Demetrius. Presently, while Oberon and Puck were roaming in the wood, they found poor Hermia trying to dismiss the persistent Demetrius. On discovering that this was the Athenian of whom Oberon had spoken, Puck at once repaired his mistake by charming the eyes of Demetrius, who, seeing Helena next, straightway fell in love with her. But imagine the dismay of Helena when she thought that both Lysander and Demetrius were mocking her in now pretending to be in love with her! Happily, what the magic love-juice could do, it could also undo, and another drop of it from Puck soon restored Lysander to his Hermia.

Oberon, in the meantime, had begun to regret the trick played upon his queen, and, having obtained the little black boy from her while she thought herself in love with the donkey-head, he made her believe that she had only been having a foolish dream, and restored her eyes to their usual sense, agreeing that they would never quarrel again. Bottom, the weaver, was also made happy by getting his own head back, though he had been happy enough with the ass's head.

The sound of a horn rang through the wood; Theseus and Hippolyta were out hunting. They came upon Helena and Demetrius, Hermia and Lysander, all of them happily reconciled to one another; and when Egeus reminded the Duke that this was the day for Hermia to make her final choice, Demetrius told how his love had changed, saying:

> And all the faith, the virtue of my heart,
> The object and the pleasure of mine eye,
> Is only Helena.

So Lysander had no longer a rival for the hand of Hermia, and to celebrate the day with merriment they all went to the palace to watch the working men's play in which Bottom, the weaver, was the principal actor.

ALL'S WELL THAT ENDS WELL

BERTRAM, the young Count of Rousillon, in the South of France, bade farewell to his widowed mother before he left their castle for the Court of the King at Paris. His mother was not alone in her sorrow over his departure, for no sooner had he gone than Helena, a lady whom the Countess had brought up as if she had been her own daughter, was overwhelmed with grief. She mourned because she loved Bertram, yet dared not let it be known, as she, the daughter of a physician, though a famous one, could not hope to marry a nobleman of the Royal blood of France.

In the midst of her grief a daring idea came to Helena's mind. The King of France was then so ill that all his learned men despaired of his life. He was suffering from a disease which her dead father had been able to cure—and the remedy for which Helena knew. "Why," thought she, "should I not also go to the Court of the King?" Her thoughts she spoke aloud, thinking herself alone; but she was overheard by a servant, who told the Countess.

Instead of being angry, the Countess told her that she had discovered the real cause of her tears, and even said she would welcome Helena as her daughter-in-law, promising to aid her in the mission to the King.

When, in due time, Helena came before the ailing King, he was unwilling to allow her to try to cure his disease; but she persisted, saying that if she failed she was willing to suffer any punishment. As her reward on his recovery, she demanded that he should give her a nobleman of the Royal blood of France as her husband, to be chosen by herself. To this he agreed.

After the King recovered, he called together a number of his courtiers, explained the terms he had arranged with the fair physician, adding that he would give her wealth and raise her rank in gratitude for having cured his disease. When Helena went forward to Bertram and signified him as her choice, the young Count hotly refused thus to be forced into marriage; but his sense of loyalty overruled his pride, and he at length agreed to marry Helena. No sooner was the ceremony over, however, than he arranged secretly to go to the wars in Tuscany, and leave his unsought bride.

Poor Helena, the unconscious messenger of evil tidings, brought back to the Countess at Rousillon a letter from her son, in which he vowed never to return. He also told Helena he would never see her again until she had obtained a ring with which he never parted.

Helena, gentle and timid in most things, was not to be repulsed in this disdainful fashion; so, dressed as a pilgrim, she set out for Florence, in the country of the wars.

In Florence there lived a widow and her daughter, Diana. Often had Bertram told Diana of his love for her, though she had always refused to listen; he even wished her to promise to be his wife when Helena would die. But Helena, unknown to Bertram, had come to stay in Florence with this widow and her daughter, nor did she ask for their help in vain. Diana now showed more friendliness to Bertram, and begged him to give her his ring, saying she would give him one in return.

In the darkness of the night, at the appointed place, without saying a single word, according to the agreement, rings were exchanged between Bertram and—not Diana, as he supposed, but Helena, whom he could not see.

Meanwhile, in France it had been given out that Helena was dead, since she had disappeared from Rousillon, and in Bertram's absence it was arranged that he should marry for the second time, but to a bride of nobler birth. Bertram, however, discovered a sudden love for the wife he supposed lost, and on returning to his ancestral castle he refused to marry again. The widow from Florence came to Rousillon, where the King was on a visit, and with her were Diana and Helena, disguised.

Diana told a strange story to the King, and when all were completely mystified by Diana declaring that the ring had been given to her, yet not to her; that Bertram had met her at midnight, yet that it was not she; the riddle was unsolved by bringing forward Bertram's still living wife, who had actually got the ring from him, and for whom the erring Count had now conceived a real affection.

So Helena and Bertram were, after many trials and misunderstandings, happily united, and "all's well that ends well."

THE STORY OF "THE TEMPEST"

LONG ago, on a bare and lonely island in the Mediterranean Sea, there lived three people. One was a wise old man, named Prospero, who had with him his beautiful young daughter, Miranda. The third was their servant, Caliban. But, although there were only three people, Prospero had yet another servant—a fairy, or a "tricksy sprite," named Ariel. Ariel loved his master dearly, because he had once been imprisoned in the heart of a pine-tree, and Prospero, who knew the secret of many mysteries, had rescued him from that strange prison, in which Ariel had been secured by the magic of an old witch, named Sycorax, who once lived on the island. Caliban was her son; a creature so low and ugly as to be scarcely human.

It happened that one day, when Miranda was looking out at the wild, storm-tossed sea, she saw a vessel in distress, and knowing that her father had learned the secrets of magic power, she begged him to calm the sea and save the poor sailors from death. But he answered that he himself had caused that very storm to rise, and calmed her fears by promising that nobody would be drowned. The story which he then told her was strange indeed.

"Twelve years ago," said he, "I was the Duke of Milan, but I cared nothing for wealth and power and fame. I was happiest only when with my little child and my books. My brother, your uncle Antonio, to whom I left the government of the state, was not like me, and, greedy of power and possessions, he wanted my dukedom for himself. To this end he went to the King of Naples—then an enemy of mine—and promised that if the King would help him to steal my lands he would richly reward him. It was so agreed, and one night these enemies of mine secured both you and me, and hurried us away into an old ship that could scarcely float. Happily, some good friend saw that the boat contained no lack of useful things, and, above all, my beloved books, which have been of so great comfort to us since our leaky vessel floated to this uninhabited island. And now the tide of fortune is turning, for, by means of the wisdom I have gained, my ancient enemies,

all of whom are in that storm-tossed ship, will soon be delivered into my hands."

Even while Prospero was talking, his fairy servant, Ariel, had made himself invisible—for, of course, he could do anything that fairies do, and might even have crouched inside a little girl's thimble. He beached the ship in less time than fifty sailors could have done it, and he brought the crew to shore, though no one could tell how. He next took Ferdinand, the son of the King of Naples, apart from the others, leading him to where Prospero and Miranda were—perhaps just by whispering in his ear! There is no outwitting a fairy like Ariel, unless one is a witch, like Sycorax.

As soon as Miranda set eyes upon the Prince, she fell in love with him. And he—well, he thought he would never be happy without her. Prospero noted this, and was delighted; but he desired to test Ferdinand's love, and pretended at first to treat him as a spy.

In another part of the island the King of Naples and his companions rescued from the ship were lying asleep, but the King's own brother, Sebastian, and Antonio, the usurper of the dukedom of Milan, were awake, and plotting to kill the King, in order that they might obtain his possessions if they got back to Italy. But they reckoned without the tricksy Ariel, whose wise master had sent him to watch over the King. The lively but invisible little sprite sang in the ear of Gonzalo, the kind old nobleman who had provided Prospero with his books and valuables when he was sent adrift, and this was what he sang:

> While you here do snoring lie,
> Open-ey'd conspiracy
> His time doth take.
> If of life you keep a care,
> Shake off slumber and beware.
> Awake! Awake!

Up started Gonzalo, then the King awakened, and they decided to set out to look for Ferdinand. So the evil designs of Sebastian and Antonio were ruined by Ariel, who led the company to a cave, outside of which Prospero had drawn a magic circle.

When they were all standing spell-bound within this magic circle, Prospero, dressed in the rich clothes he had brought from Milan, appeared before them. His old enemies were in doubt as to whether this might not be his spirit, but he told them his strange story, and said that he forgave them all freely.

The King of Naples now told Prospero that he had lost his son on the island, and Prospero, smiling, said that he had just lost his daughter. Then, leading the party into the cave, he showed them Ferdinand and Miranda playing happily together at chess.

So pleased was Prospero with the good service of Ariel that he set the faithful fairy free before the whole party sailed away for the wedding of Prince Ferdinand and Miranda.

THE MERCHANT OF VENICE

ANTONIO was the name of a very rich and generous man who lived in Venice long ago, and whose merchandise many ships carried over the seas to distant lands. Though Antonio was so rich, his greatest friend, Bassanio, was so poor that he once said of himself, "All the wealth I have runs in my veins," meaning that he was a gentleman, but lacked worldly possessions.

Now, this Bassanio loved very deeply a lady, both beautiful and rich, named Portia, who lived in a distant place called Belmont, and, when once he desired to visit her, he confessed to Antonio that he could not go there for lack of money. On hearing this, Antonio, ever ready to help a friend, began to arrange for Bassanio to get the necessary gold. Unfortunately, at that time Antonio's ships were all at sea, so that his wealth was on the waters, and for that reason he had no ready money. At length he determined to borrow from an old Jew, who was a regular money-lender. Shylock was his name, and he hated Antonio because that kind merchant would always lend his money without charging interest, thus injuring Shylock's trade. He also knew that Antonio despised him, and, above all, he disliked Antonio because he was a Christian. So when his enemy, as he regarded Antonio, came to borrow money from him, thoughts of revenge passed through the Jew's mind.

If only Antonio's ships were wrecked, or if pirates should steal from them, Antonio would not be able to repay the loan, said Shylock. But the cunning Jew then pretended to make a bargain

Where the bee sucks, there suck I;
In a cowslip's bell I lie.
There I couch when owls do cry.
On a bat's back I do fly
After summer merrily.
Merrily, merrily shall I live now,
Under the blossom that hangs on the bough.
THOMAS MAYBANK

ARIEL'S SONG, FROM SHAKESPEARE'S PLAY, "THE TEMPEST"

Ariel's Song describes the life of a fairy supposed to be the servant of a wise prince in exile, as told on p. 329.

in jest, and offered to lend the money on condition that Antonio repaid it in three months' time, or else forfeited a pound of his own flesh! Antonio did not doubt that his ships would return in time, so agreed cheerfully to this strange bargain, and got the money which enabled Bassanio, accompanied by his friend Gratiano, to go on his visit to Portia, the rich heiress.

It was known that when Portia's father was dying he gave her three caskets — one of gold, one of silver, and one of lead. On each of these was an inscription. "Who chooseth me shall gain what many men desire," was written on the gold one; "Who chooseth me shall get as much as he deserves," on the silver one; and on the lead one were the words, "Who chooseth me must give and hazard all he hath." Inside one of these caskets was a portrait of Portia, and whichever one of the men who professed to love her should choose that casket was to wed her.

Various suitors came to try their fortune in this strange lottery of love, and those who were conceited chose the gold or silver caskets. But now came Bassanio, whom Portia really loved, and she and her maid, Nerissa, trembled lest he should take the wrong casket. He chose the leaden one, in which, of course, was the portrait.

In the midst of all their joy at this happy choice, Bassanio receives a letter from Antonio, who says that all his ships are lost, and Shylock is demanding his pound of flesh; but adds that he would gladly die for his friend if Bassanio were only there to bid him farewell.

Bassanio told his lady the unhappy story, and she bade him haste away to be with his friend; but as soon as he had gone she sent to her cousin, a famous lawyer, Doctor Bellario, to borrow his robes, and with these for herself, and the dress of a lawyer's clerk which she had borrowed for Nerissa, Portia and her maid set out for Venice.

Assembled in the Court of Justice there were all those interested in the strange case — Antonio, Bassanio, Shylock, Gratiano, the Duke of Venice, and many others — when Nerissa, dressed as a lawyer's clerk, entered and read a letter from Doctor Bellario, in which he wrote that he was ill; but his young friend, Doctor Balthazar, from Rome, would defend the case ably, and that he had never known "so young a body with so old a head." Thus was Portia, disguised as a lawyer, announced.

Now, Portia was as wise as she was beautiful, and in her speech she first of all raised the hopes of Shylock until he praised her for "a Daniel come to judgment." He was entitled to the pound of Antonio's flesh, she argued. But she made two conditions — first, he must take exactly one pound in weight, not the weight of a hair more or less; and secondly, he must not take one drop of blood, as that was not mentioned in the bond.

Of course, these conditions were impossible, and Shylock, now seeing where his blind hatred of "the fool that lends out money gratis" had led him, was willing to leave the court without his money, since to take his bond would have led to his being condemned to death himself. But Portia would not let him go so easily. She stayed him, saying: "There is a law whereby, if any foreigner in Venice shall scheme against the life of a citizen, his money shall be forfeited, half of it going to the State, the other half to his intended victim, and his own life will rest with the mercy of the Duke."

Thus Shylock lost his bond and might have lost his life; but that was spared on condition that he willed his fortune to his own daughter, Jessica, whom he had ill-treated, and to her lover, Lorenzo, and also that he renounced his religion.

In his delight at the happy issue, Bassanio offered the pretended doctor of laws anything he might ask; but, to his dismay, a ring which Portia had given him on his departure from Belmont was required of him. The lawyer's clerk also demanded Gratiano's ring, which Nerissa had given to him.

When Bassanio returned to Belmont, bringing with him Antonio to see Portia, she and Nerissa asked for their rings, which neither of the men could produce. After pretending to be very angry with their lovers, Portia and Nerissa showed the rings on their own fingers. Antonio then knew whose wise speech had saved his life, and his joy was complete when Portia gave him a letter in which it was stated that three of his ships, which were thought to be lost, had safely come to port.

THE NEXT STORIES OF FAMOUS BOOKS BEGIN ON PAGE 443.

SISTER DORA & THE TOILERS OF WALSALL

CONTINUED FROM 258

IN the little village of Hauxville, in Yorkshire, there was born in the year 1832 a little girl who was named Dora Pattison, but who, when she grew to womanhood, was lovingly called by the hard-fisted toilers in the iron-foundries of Walsall "Our Sister Dora," a name that suited her well.

She was a bright, bonnie, merry girl who much liked to get her own way, and growing restless in the little country village where her home was, longed to go with Florence Nightingale to nurse the wounded soldiers in the Crimea. She was not then trained for nursing, and her father would not consent to her going, so she stayed at home and taught the village children. But she soon found her life-work in nursing and caring for sick people. She seemed to bear a charmed life, to have strength more than human, and her courage, self-sacrifice, and devotion to all who needed her help made her life one long golden deed.

In 1864 Sister Dora joined the Sisterhood of the Good Samaritan at Coatham, in Yorkshire, and the experience she thus gained in nursing poor people and taking interest in their needs was very helpful to her in her future hospital work.

Where pain and misery were, there was Sister Dora to help and cheer. When a worker in a coal-mine met with an accident and the surgeon at her hospital wanted to cut off his right arm, it was Sister Dora who pleaded with him to let her try to save it. She did save it, too, and the grateful man used afterwards to walk eleven miles every Sunday to ring the hospital bell with that arm, and inquire about Sister Dora, when she was lying ill herself. It was Sister Dora who helped a poor little burnt child to die so happily, that with almost her last breath she said she would meet Sister Dora in heaven with a bunch of flowers!

When small-pox broke out in the town, Sister Dora spent her hours of rest in nursing in their own homes those who had none to care for them. For six months she battled with disease and death almost single-handed, herself putting sufferers into the ambulances, and taking them away to be nursed, struggling with delirious patients and mothering every sick child. And with all her ceaseless work and untiring energy, she was so strong, cheery, merry, and full of fun, that she *made* her patients want to get well; as one of them said, "She'd make you laugh if you were dying." No one could be gloomy or hopeless when looking on her face, for it was aglow with the beauty of a loving, unselfish spirit.

Far too soon Sister Dora had spent all her strength for others; yet true to her noble nature she worked to the end, keeping her own suffering hidden from those around, and passing from one bed to another with her soothing touch, her cheery word, and her loving smile.

THE QUEEN WHO GAVE UP HER BOY

NEAR the beginning of the sixteenth century there was born at Fontainebleau, in France, a little girl, Jeanne d'Albert, heiress to the kingdom of Navarre and niece to the French king, Francis I. She hardly knew her parents, but was brought up in the country by her governess, and until she was nine years of age did not realize that she was kept a prisoner by her uncle, King Francis, in a castle on the banks of the Loire. This the king did, that when she was quite a child he might compel her to marry a Protestant duke. Little Jeanne was very unwilling to marry the duke the king chose, and was glad when the Pope annulled the marriage, and she was free to wed as she chose.

During the peaceful years she spent at Pau, Jeanne studied and learned to love the religion of the Huguenots, the persecuted Protestants of France, and her husband proving a worthless character, she devoted herself to their cause. On the death of her old father, she became Queen of Navarre, and while dark clouds were gathering round the heads of the Huguenots, she helped and encouraged them all she could.

The homeless and persecuted were ever welcome at her court, which grew to be looked on as a haven of refuge by the sorely troubled Huguenots. When their leader, the Prince of Condé, fell in the disastrous battle of Jarnac, in 1669, and hope seemed dead, the faithful Queen of Navarre came to their aid. She rode into the camp among the despondent soldiers, bringing with her two fine bright boys— her only son, Henry, aged about fifteen, and his cousin, the now fatherless Prince of Condé, a boy of twelve, whom she had adopted. In stirring words she rallied the little army to defend their religion, and to avenge the death of their beloved Condé. Presenting the two boys, she cried:

"Soldiers, I offer you everything I have—my kingdom, my treasures, my life, and, more precious than all, my children."

These words were received in breathless silence, and then, as Prince Henry galloped into their midst, the soldiers greeted him with cheers as their leader. In clear, ringing tones, he swore never to desert them.

Dark days were before the Huguenots, and to them the sacrifice of the Queen of Navarre seemed vain in the light of after events; yet who shall say that it was so, when her noble deed revived the courage of the Huguenots at a time of defeat, and helped to keep alive the Protestant religion in France.

THE BOY WHO WOULD NOT FIGHT AGAINST FREEDOM

HERE is the story of a young Italian who well deserves to be called a hero, though no one even knows his name. In the middle of the last century, there was no kingdom of Italy as there is now. The southern part was the kingdom of Naples, where the king was a foreigner, and the government was very harsh. Most of the northern half was under the rule of the Austrian emperor; and the Italians hated, as much as we should do, to feel that they were held under a foreign yoke, and the peasants rose in arms to win their freedom. They succeeded after a long struggle; and the first king of United Italy was Victor Emmanuel.

Now, the Austrians sent troops into Italy to crush the rebels. But, besides the Austrian soldiers, they compelled many of the Italian peasants to join the regiments which were engaged in preventing the people of Italy from winning their liberty. The peasants could not resist; they could only do their best, at great risk to themselves, to give what aid they could to the bands of insurgents. If they were dragged off into the Austrian ranks, they were obliged to fight against their own countrymen to save their own lives.

But there was a young lad among those who were thus forced to carry arms against the Italian patriots, and he resolved that it was better to face death than to help in an evil cause. He could not resist the Austrians, but even in self-defense he would not fight against the liberators. And so, when his first battle was over, he was found slain by a bullet, with a smile on his face, holding the musket in his dead fingers.

But the musket had never been loaded. He gave his life for Italy without even fighting to save it, and a great poetess has given him immortality.

THE NEXT GOLDEN DEEDS ARE ON PAGE 475.